TECHNICAL REPORT
NATICK/TR-16/022

AD _____

SOLDIER QUALITY OF LIFE ASSESSMENT: FINAL REPORT

by
Justine Federici
and
Jason Augustyn*

***Oak Ridge Institute for Science and Education (ORISE), Oak Ridge Associated Universities (ORAU) Maryland**
Belcamp, MD 21017

September 2016

Final Report
October 2013 – November 2014

U.S. Army Natick Soldier Research, Development and Engineering Center
Natick, Massachusetts 01760-5020

DISCLAIMERS

The findings contained in this report are not to be construed as an official Department of the Army position unless so designated by other authorized documents.

Citation of trade names in this report does not constitute an official endorsement or approval of the use of such items.

DESTRUCTION NOTICE

For Classified Documents:

Follow the procedures in DoD 5200.22-M, Industrial Security Manual, Section II-19 or DoD 5200.1-R, Information Security Program Regulation, Chapter IX.

For Unclassified/Limited Distribution Documents:

Destroy by any method that prevents disclosure of contents or reconstruction of the document.

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

1. REPORT DATE *(DD-MM-YYYY)*	2. REPORT TYPE	3. DATES COVERED *(From - To)*
23-09-2016	Final	October 2013 – November 2014

4. TITLE AND SUBTITLE
SOLDIER QUALITY OF LIFE ASSESSMENT: FINAL REPORT

5a. CONTRACT NUMBER

5b. GRANT NUMBER

5c. PROGRAM ELEMENT NUMBER
633001

6. AUTHOR(S)
Justine Federici and Jason Augustyn*

5d. PROJECT NUMBER
VT5

5e. TASK NUMBER
RK09

5f. WORK UNIT NUMBER

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)
U.S. Army Natick Soldier Research, Development and Engineering Center
ATTN: RDNS- SEW-TDC
10 General Greene Avenue, Natick, MA 01760-5020

8. PERFORMING ORGANIZATION REPORT NUMBER
NATICK/TR-16/022

9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES)

10. SPONSOR/MONITOR'S ACRONYM(S)

11. SPONSOR/MONITOR'S REPORT NUMBER(S)

12. DISTRIBUTION / AVAILABILITY STATEMENT
Approved for public release; distribution is unlimited

13. SUPPLEMENTARY NOTES
* Oak Ridge Institute for Science and Education (ORISE), Oak Ridge Associated Universities (ORAU) Maryland, 4692 Millennium Drive, Suite 101, Belcamp, MD 21017

14. ABSTRACT
This report documents survey research and modeling of Soldier quality of life (QoL) on contingency base camps by the U.S. Army Natick Soldier Research, Development and Engineering Center. The purpose of this work, which was conducted in support of the Sustainability/Logistics Basing Science and Technology Objective Demonstration, was to develop a way to quantify QoL for camps housing fewer than 1000 personnel. A discrete choice survey was conducted with 1,227 Soldiers at five Army installations to identify preferences across 84 attributes that characterize contingency base camps, including attributes related to billets, field feeding, field hygiene, MWR, spiritual and psychological support, personal security, and work area. Survey results were analyzed using hierarchical Bayesian logistic regression to develop a quantitative model for estimating QoL based on base camp design. QoL was sensitive both to attributes that impact base camp sustainability (e.g., shower frequency) and attributes with less effect on sustainability (e.g., type of bedding). The data and model discussed in this report represent a new capability for quantifying the link between base camps and Soldier QoL and can support system developers and Army leaders in assessing tradeoffs between QoL and resource demands such as fuel, water, and waste.

15. SUBJECT TERMS

ENERGY	SOLID WASTES	QUESTIONNAIRES	QOL(QUALITY OF LIFE)
SURVEYS	WASTE WATER	LIVING STANDARDS	OPERATIONAL READINESS
MORALE	SUSTAINABILITY	WASTE REDUCTION	SUSTAINMENT LOGISTICS
EMOTIONS	QUALITY OF LIFE	MENTAL READINESS	FUEL DEMAND REDUCTION
FEEDBACK	ARMY PERSONNEL	ARMY SUSTAINMENT	WATER DEMAND REDUCTION
USER NEEDS	DATA COLLECTION	CONTINGENCY BASES	ENVIRONMENTAL MANAGEMENT
BASE CAMPS	DEMONSTRATIONS	REDUCED FOOTPRINT	

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT	b. ABSTRACT	c. THIS PAGE			Justine Federici
U	U	U	SAR	160	19b. TELEPHONE NUMBER *(include area code)* 508-233-4321

This page intentionally left blank

Table of Contents

List of Figures

List of Tables

SOLDIER QUALITY OF LIFE ASSESSMENT: FINAL REPORT

1. Introduction

The Natick Soldier Research, Development and Engineering Center (NSRDEC) conducted a survey with approximately 1,200 Soldiers to receive feedback on critical aspects of Quality of Life (QoL) at contingency base camps. Data were collected from July through September 2014 at the following locations: Ft. Polk, Ft. Stewart, Ft. Riley Joint Base Lewis McChord, and Camp Edwards. Approximately 300 Soldiers completed surveys at each of these data collection sites. Including preliminary qualitative research, pilot testing, and analysis, the QoL research covered in this report spanned a performance period from October 2013 to November 2014.

The effort was led on behalf of the Sustainability/Logistics Basing Science and Technology Objective Demonstration Basing Demonstration (SLB-STO-D). The SLB-STO-D is a multi-year, 6.3 Army advanced technology development program whose goal is to reduce fuel resupply by 25%, reduce the need for water resupply by 75%, and decrease waste generation/backhaul by 50% while maintaining Force Provider-like QoL for the resident forces. The scope of SLB-STO-D is specifically on:

- Contingency base camps primarily found OCONUS
- Contingency base camps housing 1,000 personnel or less
- Technologies or non-material solutions that relate to base camp life support

Due to this focus on base camp life support, the research team has operationally defined base camp QoL as a measure of how well a given camp supports the physical and mental (to include the cognitive, social, and emotional dimensions) readiness of Soldiers.

1.1. Background

The importance of contingency base camps became clear with the advent of extended overseas operations beginning with Desert Storm in August of 1990 followed by Desert Shield in December of 2005. As a result, there were rapidly growing numbers of contingency base camps being established overseas. In fact, over the past two decades over 1,000 contingency camps have been established (Army Technical Publication 3.37-10). The Red Book and the Sand Book were written during this time (February 2004 and April 2009 respectively) in order to try to capture essential guidelines as well as the tactics, techniques, and procedures (TTPs) necessary to build and sustain these overseas contingency camps. Although these documents were written as stop-gaps during highly evolving times, they captured many essential points that served as the foundation for the establishment of the SLB-STO-D as well as this research on Soldier QoL. For example, the Red Book states that part of the Commander's master planning goals is to improve Soldier QoL. It goes on to state that maintaining living conditions and QoL to enhance Soldier readiness is a key objective for the Commander. The Sand Book reiterates these sentiments and states that "the base camp master plan (BCMP) enhances force protection, improves operational readiness and personnel safety conditions, provides efficient use of limited resources, and improves living conditions and quality of life." These documents clearly establish and emphasize

the importance of base camp QoL and Soldier readiness, which serves as the foundation of this research study.

The other key issue raised in both of these documents concerns the limited resources (to include fuel and water) that are available on a camp in order to provide certain levels of QoL. This issue is further expounded upon in The Noblis report, which was published in May of 2010. It discusses the importance of conserving resources on contingency base camps. Specifically, it gives an overview of the logistical components and practices required to develop, build, and sustain Forward Operating Bases (FOBs) and is one of several documents that served as the foundation of the SLB-STO-D goals to reduce fuel, water, and waste while maintaining Soldier QoL.

The Concept of Operations for Army Contingency Basing, published in August of 2013, is another document that supports the objectives of the SLB-STO-D. It was developed due to the lack of a comprehensive contingency basing strategy. It discusses the lack of consistent standards, training, and equipment in regards to contingency camps, and outlines impacts that are a result of this to include Soldiers being diverted from their primary mission. It specifically states that the lack of a contingency basing strategy causes Soldiers to have reduced mission readiness and effectiveness due to excessive manpower burdens, due to inefficient basing systems, and the lack of consistent QoL.

Army Techniques Publication (ATP) 3-37.10 (April 2013) written to replace the Red Book and the Sand book, provides an integrated and systematic approach to base camps. It refers to QoL in terms of basic, expanded, and enhanced levels, providing further doctrinal support for the importance of QoL in base camp planning and a framework that acknowledges varying levels of QoL. However, the ATP does not provide a metric for assessing Soldier QoL, nor does any such metric exist within the contingency basing community. In the absence of an approach for quantitatively measuring QoL it is extremely difficult to understand how changes in material and non-material aspects of a camp would affect the Soldiers living and operating from it. In the context of SLB-STO-D, the lack of a metric for QoL makes it almost impossible to ensure that technology-enabled reductions in fuel, water, and waste have a negligible effect on QoL. Therefore, the main objective of this research project was to develop a quantitative framework for QoL based on Soldier data.

One key accomplishment that was critical to the QoL effort framework development was the establishment of Operationally Relevant Technical Baselines (ORTBs) by the SLB-STO-D (SLB-STO-D, 2014). These baselines describe typical base camp conditions during deployments for overseas operation in Afghanistan-like conditions. These baselines were established for three camp sizes: camps housing 50 personnel or less, 51-300 personnel, and 301-1,000 personnel. They were based on subject matter expert (SME) input as well as an extensive investigation of current regulations and doctrine. The baseline documents outline all of the systems, TTPs, and personnel that would reside at each of the three camp sizes.

A wargame was also conducted with Soldiers who had experience operating out of base camps that were typical of deployments during 2011-2012 (Augustyn et al., 2012). The purpose of the

wargame was to exercise the three baseline models of contingency base camps to determine the accuracy of the baselines relative to current basing practices and TTPs.

Finally, extensive interviews were conducted with Soldiers to learn about what their base QoL was like during their deployment. These interviews were held with Soldiers of varying rank and Military Occupational Specialty (MOS). The criteria for participation was that the Soldiers must have had recent deployment experience at camps housing 1,000 personnel or less. During the interview sessions, the Soldiers described what conditions were like on their base camp. They also discussed what factors they believed were most important to their QoL, such as having hot showers or care packages from home.

All of these efforts combined, to include the baseline assumption documents, wargame, Soldier interviews, and SME input, were the foundation for building the comprehensive attribute framework that contains 84 base camp attributes that influence Soldier QoL (see Appendix A for a list of all attributes and levels). These attributes align with seven major base camp functional areas: billeting; field feeding; field hygiene; personal security; work area; morale, welfare, and recreation (MWR); and spiritual and psychological support. For instance, field feeding includes attributes such as "breakfast rations" and "dining area" that describe what ration options are available to soldiers for breakfast (Figure 1) and whether a shelter is available for them to sit in while dining. Each attribute is associated with a set of service levels that cover the range of conditions Soldiers might experience on a camp. For example, the "breakfast rations" attribute includes the levels Meal-Ready-to-Eat (MRE), Unitized Group Ration - Heat & Serve (UGR-H&S), Unitized Group Ration Express (UGR-E), Unitized Group Ration A (UGR-A), and meals from non-ration sources (to account for contractor-prepared meals and other food sources).

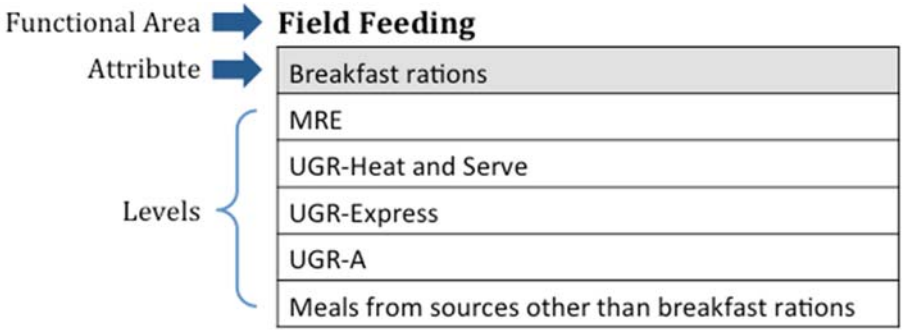


Figure 1. Example of attribute and levels.

These attributes and their corresponding levels map to systems within a camp that have a fuel, water, and waste burden and can be traced to each of the three baseline camps established by the SLB-STO-D. For example, showers are not available at the 50 personnel camp and the resident Soldiers would have the MRE for breakfast and dinner and the UGR-E for lunch. In contrast, the Soldiers at the 300 and 1,000 personnel camps have containerized showers such as those provided by Force Provider and are eating a combination of the UGR-A and MREs.

The attribute framework was used to create a quantitative model for estimating Soldier QoL based on the systems resident at a base camp. Data to populate this model were captured through

the data collection effort described in this report. An electronic survey that was administered via a tablet computer was developed. The survey was designed to obtain, from the Soldier perspective, which of the 84 attributes within the framework are key to their QoL.
The data collected from this survey and incorporated into the framework will allow the SLB-STO-D and other contingency base stakeholders to measure, baseline, and model base camp QoL. Specifically, this work included both material items such as technologies or systems available on the camp (e.g. kitchens, latrines, etc.) as well as non-material aspects of a camp such as timed showers or other leadership enforced practices. This model will enable the SLB-STO-D to assess their progress towards reducing fuel, water, and waste while maintaining Soldier QoL. In addition, the model allows the SLB-STO-D to assess the impact of candidate technologies within their portfolio on Soldier QoL and make informed trade-offs while taking into account Soldier priorities.

2. Methods

2.1. Participants

A total of 1,227 Soldiers completed the QoL survey across five Army installations: Fort Polk, LA; Fort Riley, KS; Fort Stewart, GA; Joint Base Lewis-McChord, WA; and Camp Edwards, MA. Table 1 provides the sample sizes for each installation. All data were collected during the summer of 2014. Demographic data for the sample are presented in the results chapter.

Table 1. Breakdown of survey sample sizes from each data collection site.

Post	N
Polk	286
Riley	285
Stewart	276
Lewis	301
Edwards	79

2.2. Survey Procedure

The survey was administered via custom software written to run on Samsung Galaxy tablet computers running Windows 7. Data were collected at each survey site in a total of 10 sessions, with 10-30 Soldiers completing the survey in each session. The survey was administered indoors in a classroom setting with adequate lighting, seating, and climate control.

Upon arriving at the survey location the participants were informed of the overall goal of the project and received a short instructional briefing on how to complete the survey. During the briefing, the Soldiers were shown screen shots from each section of the survey to illustrate how each section should be completed. In addition, the Soldiers were given a brief demonstration on how to use the tablet computers.

The survey itself was comprised of three sections:

- Section 1: Demographics
- Section 2: Camp profile
- Section 3: Camp comparisons

Section 1 contained demographic questions including age, rank, years of military service, MOS, and deployment history. The deployment history section asked Soldiers to list all deployments within the past 24-36 months. For each deployment, Soldiers provided details on where they were deployed (Iraq, Afghanistan, or other), the duration of the deployment, and the unit they deployed with.

Section 2 of the survey was designed to capture the Soldiers' experiences operating out of base camps during their most recent deployment. Soldiers were asked if they had spent time at base camps housing a) 50 U.S personnel or less, b) between 51-300 U.S. personnel, and c) 301-1,000

U.S. personnel. If the Soldiers indicated that they had spent time at camps in more than one size category they were asked to estimate the percentage of their most recent deployment spent at each camp. The survey software used this response to identify which size category the Soldiers had spent the most time at, and asked them to focus on this primary camp for the remainder of the second section of the survey.

With the camp they spent the most time at in mind, the Soldiers were then asked to respond to a series of 84 questions regarding the design of their primary camp. Each question focused on one base camp attribute and asked Soldiers to choose the attribute level which best described their camp. They were instructed that if there was not an exact match to their experience, they should select the option that was closest to what the camp conditions were like for the majority of their time there. In addition to a verbal description of each attribute level, the survey provided pictures to help clarify each level. An example is shown in Figure 2. Section 2 concluded with a question asking the Soldiers to rate the overall QoL at their primary camp on a visual analog scale ranging from worst imaginable QoL to best imaginable QoL. Responses to this question were used as additional validation data for the QoL model described below.

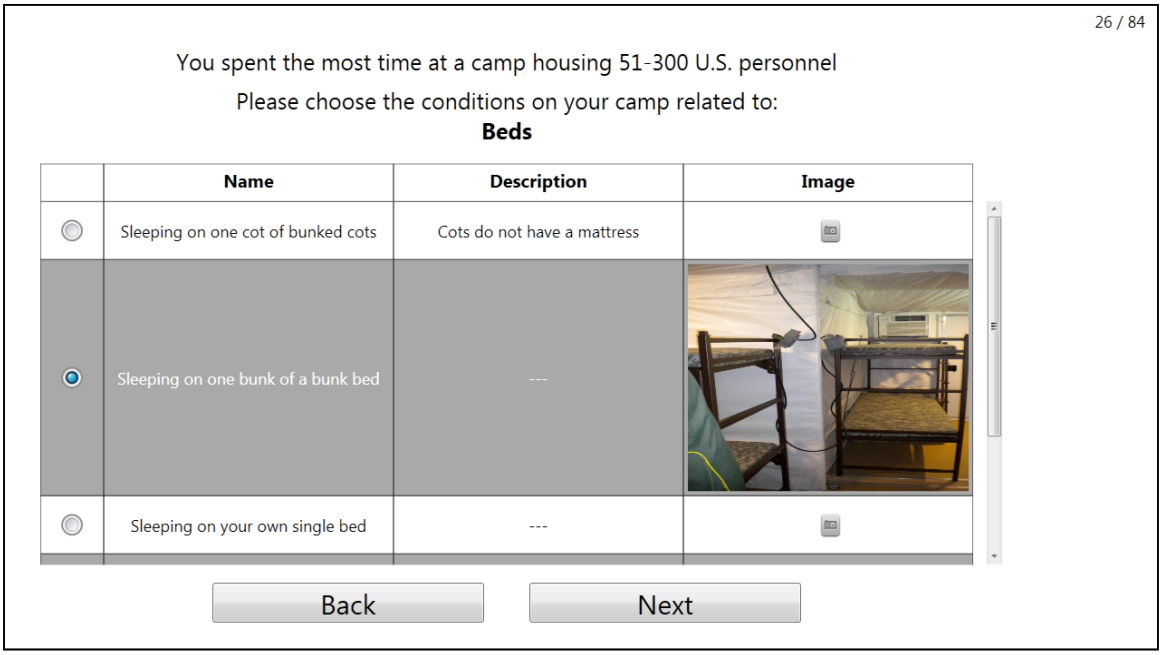


Figure 2. Example of Section 2 question and clarifying picture.

Section 3 of the survey implemented a discrete choice experiment (DCE) designed to assess the relative importance of each attribute level in determining QoL. DCEs are a widely used technique for revealing consumer preferences for product attributes with a solid foundation in econometric utility theory (Louviere, Flynn, & Carson, 2010). In a DCE, survey respondents are presented with a choice among several product profiles that differ on a set of attributes. The respondents' task is to choose the product that they find more appealing. By carefully designing the profiles, a DCE can reveal the implicit tradeoffs that people make among product attributes, leading naturally to a utility model that can be used to predict consumer preference for each

attribute level. One of the appealing qualities of a DCE is that it mimics the kind of choice behaviors that people make in the real world.

The present survey used a DCE involving a series of comparisons between two notional base camps that differed on a subset of four attributes. For example, a given question might contrast camps that offered different levels of breakfast ration variety, shower frequency, weight-lifting exercise equipment, and living space in the billets. Solders were asked to rate which of the two camps would provide a better QoL. The response scale was a five-point metric paired comparison ranging from "strongly prefer camp A" to "strongly prefer camp B". The scale included a midpoint indicating no preference between the camps. An example is shown in Figure 3. Each Soldier completed 30 of these comparisons. The choice of attributes and levels for each trial was random with the constraints that all attribute levels were presented an approximately equal number of times and all combinations of attributes were presented an approximately equal number of times. These constraints created a balanced survey design.

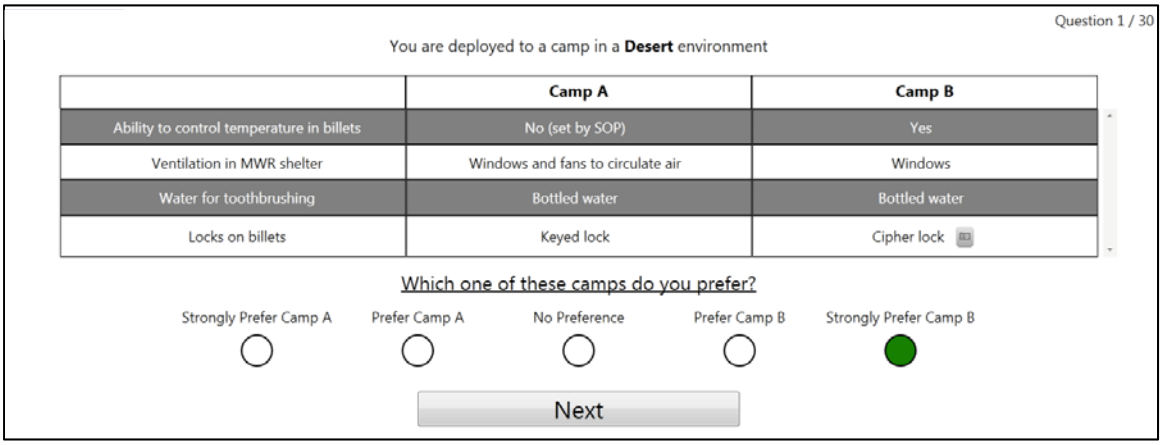


Figure 3. Example of the discrete choice task used in Section 3.

3. Results

3.1 Demographics

Within the survey sample, 1,175 of the respondents were male and 52 were female (95.76% and 4.24% of the sample, respectively). The mean age of the Soldiers was 27.71 (*SD* = 6.31).

There were 1,101 enlisted personnel, 123 officers, and 3 warrant officers who completed the survey (89.73%, 10.02%, and 0.25% of the sample, respectively). Figure 4 shows the distribution of enlisted and officer ranks within the sample. A broad range of MOSs was represented in the survey sample. As shown in Table 2, there were 25 MOS fields in the sample, with a high density of Soldiers in Infantry, Engineer, Armor, and Field Artillery specialties. Soldiers within the Armor field were all Cavalry Scouts (MOS 19D).

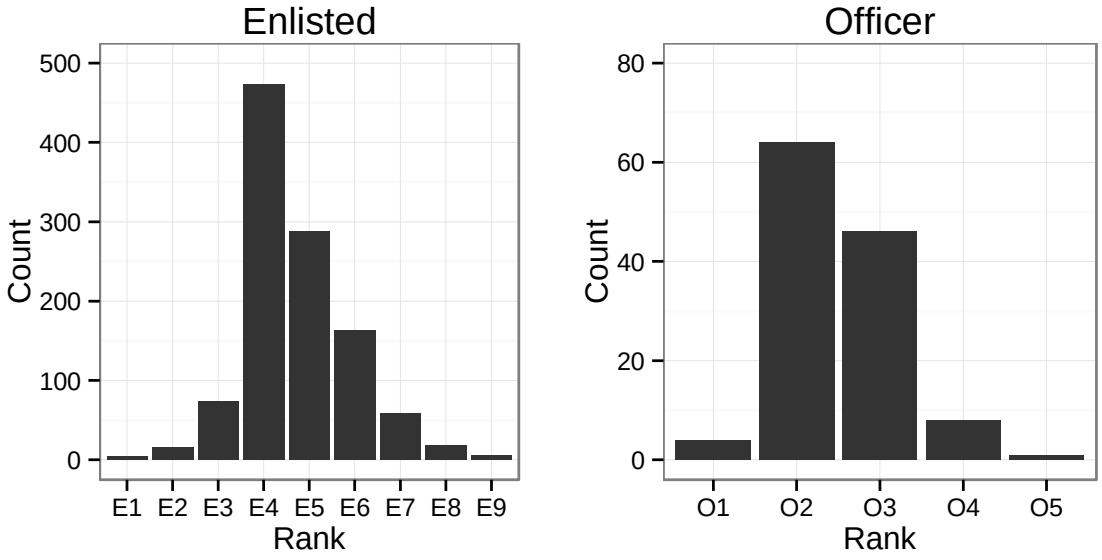


Figure 4. Distribution of office and enlisted ranks within the survey sample.

Table 2. MOS fields represented in the survey sample.

MOS Field Code	Field Name	N
11	Infantry	466
19	Armor	153
12	Engineers	120
13	Field Artillery	111
68	Medical	94
91	Mechanical Maintenance	65
25	Signal	50
35	Military Intelligence	37
92	Quartermaster	33
88	Transportation	20
74	Chemical	15
42	Adjutant General's Corps	12
18	Special Forces	10
94	Electronic/Missile Maintenance	8
15	Aviation	7
70	Medical Operations	7
31	Military Police	6
29	Electronic Warfare	3
14	Air Defense Artillery	2
30	Information Operations	2
90	Logistics	2
36	Financial Management	1
46	Public Affairs	1
65	Medical Service Corps	1
89	Ammunition	1

All of the Soldiers who completed the survey had deployed at least once during their Army career – the mean number of deployments was 1.82 (*SD* = 1.28). A majority of the sample had between one and four deployments, and some deployed five or more times as shown in Figure 5. A majority of the Soldiers had last been deployed within the past 24 months, though some of the National Guard Soldiers that were surveyed had deployed less recently – over 5 years ago in 11 cases. Figure 6 shows the complete distribution of Soldiers who had completed a deployment within the past 66 months. Again, while a few Soldiers had last deployed over 5 years ago, 94.98% fell within a 36-month time frame. Across the sample, the mean period since the last deployment was 16.79 months (*SD* = 11.61; Median = 15 months). The majority of the Soldiers (*N* = 1077) had most recently deployed to Afghanistan, with 67 last deploying to Iraq, and 83 to other theaters (e.g., Senegal).

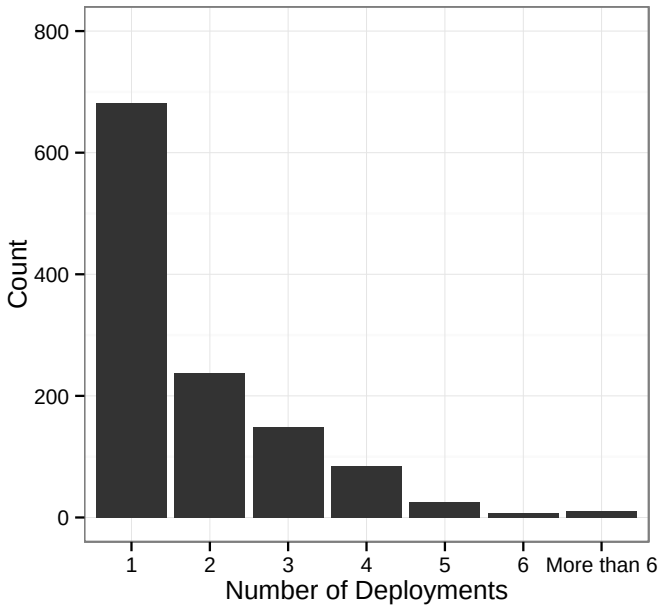


Figure 5. Distribution of the number of deployments reported by Soldiers in the survey sample.

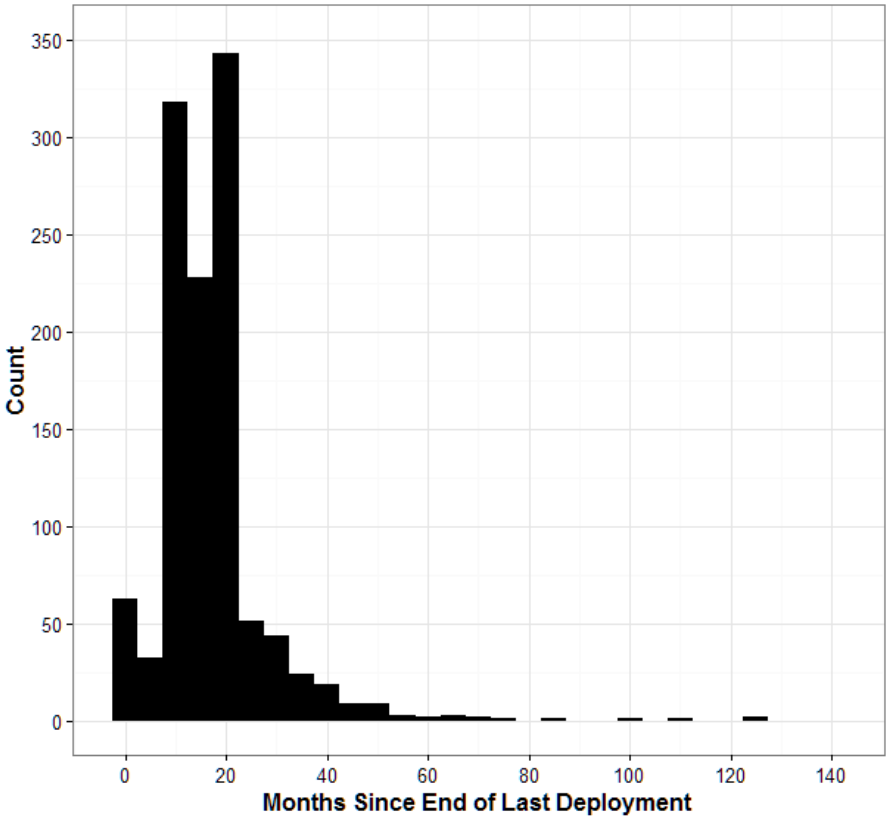


Figure 6. Distribution of the time that had passed since each Soldier's last deployment.

3.2 Base Camp Experience

In the second section of the survey, Soldiers provided details on the camp housing fewer than 1,000 personnel that they spent the most time at during their most recent deployment. Of the 1,227 Soldiers who completed the survey, 229 (18.66%) spent the most time at a camp housing 50 or fewer personnel, 489 (39.85%) spent the most time at a camp housing 51-300 personnel, and 509 (41.48%) spent the most time at a camp housing 301-1,000 personnel.

The Soldiers described the conditions on the camp that they spent the most time at by answering a series of questions framed around the QoL attributes. Each question presented a single attribute along with its associated levels. Soldiers chose the level that was most similar to the typical conditions they experienced (for example, if they ate MREs for breakfast most mornings, they would choose that option for the Breakfast Rations attribute). Contingency tables were constructed for each attribute to evaluate the frequency of each attribute level across each of the three camp sizes (50, 300, and 1,000 personnel). Chi square analysis was used to evaluate whether there were statistically significant differences in the conditions that Soldiers experienced across the three camp sizes. Results of these analyses are detailed in Appendix A.

In addition to describing the conditions at the camp they spent the most time at, Soldiers were also asked to provide an overall rating of their QoL at this camp. Soldiers rated QoL on a visual analog scale ranging from "worst imaginable quality of life" to "greatest imaginable quality of life". Figure 7 shows the mean rating provided by Soldiers with experience living at each camp size. An Analysis of Variance (ANOVA) with camp size as a factor found that the perceived QoL was different across the three camp sizes, $F(2,1224) = 44.96$, $p < .001$. Post-hoc tests using Welch's t-test found that QoL ratings were significantly different between 50 and 300 personnel, $t(418.73) = -4.16$, $p < .001$; between 50 and 1,000 personnel, $t(396.80) = -8.56$, $p < .001$; and between 300 and 1,000 personnel, $t(988.69) = -6.03$, $p < .001$.

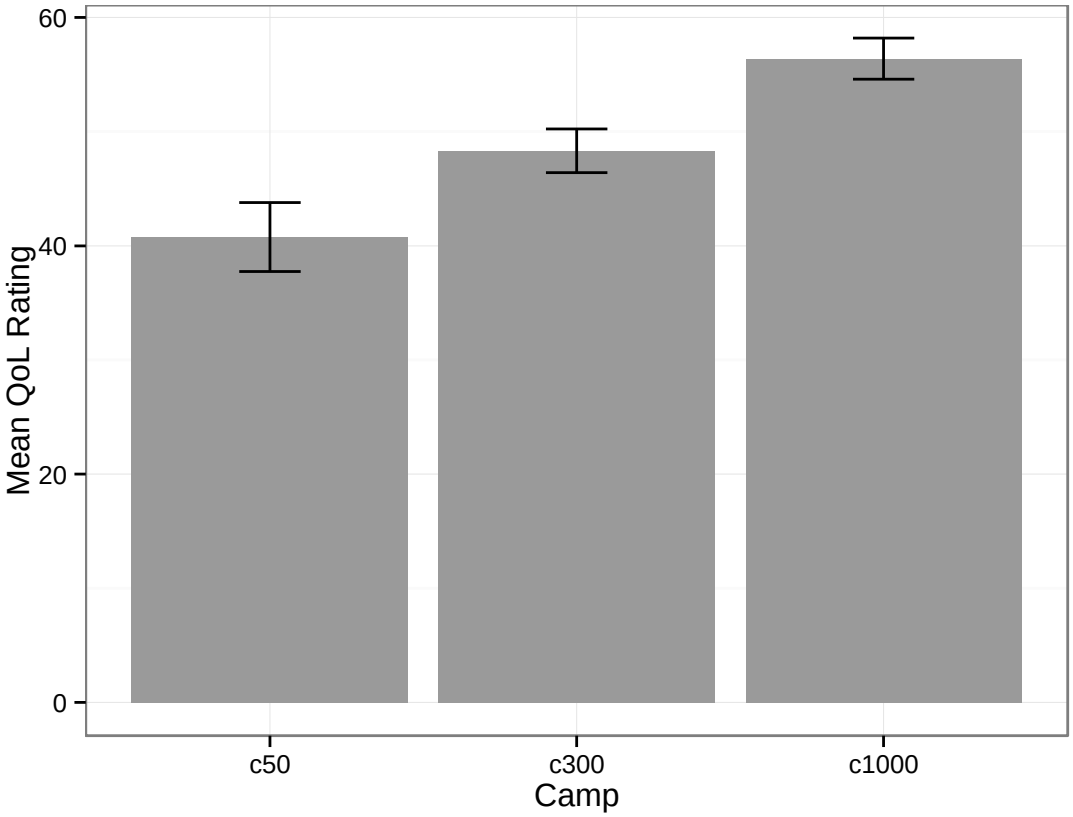


Figure 7. Mean QoL ratings given by Soldiers who had the most experience operating out of camps housing 50 or fewer Soldiers (c50), 51-300 Soldiers (c300), and 301-1,000 Soldiers (c1000)

3.3. QoL Modeling

One difficulty in analyzing the DCE data that were collected during the third section of the survey is that it is rarely possible to show survey respondents all possible combinations of attribute levels. In the current study, there were 84 attributes with a total of 306 levels. It would be impossible for any individual Soldier to complete enough choice comparisons to record data on all possible combinations of attribute levels. This is a common problem in consumer research studies involving complex, multi-attribute products. To create surveys that don't overwhelm respondents, the standard practice is to show each respondent a manageable number of *partial profiles* that cover only a subset of the total comparison space. Data from multiple respondents are then combined statistically to estimate the utility of all attribute levels.

A critical consideration in analyzing partial profile discrete choice data is how to combine individual data sets to determine attribute-level utilities. One approach is to simply aggregate all of the individual participant data into a single data set and analyze using an appropriate regression model. However, this method only allows utility modeling at the group level – it is impossible to recover utility values at the level of individual survey respondents. Aggregation treats all respondents as homogenous units and eliminates the ability to look for individual differences in preference structure due to demographics, experience, and other personal characteristics.

An alternative that has become popular over the past several years is Hierarchical Bayesian Estimation (HBE; Orme, 2000). As the name implies, HBE models choice behavior at two, hierarchically related, levels. The first level operates at the sample level and identifies a distribution of model parameters (e.g., regression coefficients) based on shared variance amongst a respondent sample. In effect, the first level is an aggregate model that estimates parameters across survey respondents by treating them all as homogenous units, identical from the model's point of view. The second level considers the distribution of model parameters at the individual level. Estimation starts by drawing initial parameter values for every respondent from a common distribution (called the *prior* in Bayesian terminology). Then, Markov Chain Monte Carlo (MCMC) methods are used to iteratively refine the estimates for each individual based on his or her observed choice data. Ideally, the model will ultimately converge on stable, best-fitting estimates for each individual respondent. As a result, HBE can produce individual part-worths for every Soldier who completed the QoL survey. By definition, these estimates will take into account differences amongst respondents based on demographics and experience. This ability to construct individual-level utility models is one of the primary strengths of HBE. Among other advantages, this approach allows researchers to look for differences in preferences among user/consumer segments (e.g., officers vs. enlisted, combat vs. support personnel, males vs. females).

In the present case, HBE was applied to estimate a linear regression model in which the regression coefficients reflected the utility of a particular attribute level for improving QoL. The response variable for this analysis was the metric paired comparisons data Soldiers generated during the survey by comparing pairs of notional base camps. In the DCE task, Soldiers indicated their degree of preference between two notional camps that differed on four attributes, and the camps never shared the same level of the presented attributes. Preference data were coded on an interval scale ranging from -2 to 2, corresponding to strong preference for "Camp A" in a comparison set vs. "Camp B", respectively, with 0 indicating no preference. Following Rossi, Allenby, and McCulloch (2006), the predictors for the model were coded as difference scores for each trial indicating the presence of particular combinations of attributes levels for the two camps. Specifically, for each attribute level a score of -1 indicated that Camp A had that level (while Camp B did not), a score of 1 indicated that Camp B had that level (while Camp A did not), and a score of 0 indicated that neither camp had that level. Table 3 provides an example of this coding scheme.

Table 3. Example of the coding scheme used in the hierarchical Bayesian regression model.

		Breakfast Rations				Billet Construction		
Trial	Response	UGR-H&S	UGR-E	UGR-A	…	Hybrid	Rigid-Walled	Hard Stand
1	-2	-1	0	1	…	0	0	0
2	-1	0	0	0	…	0	-1	1
…	…	…	…	…	…	…	…	…
29	0	-1	1	0	…	0	1	-1
30	1	0	0	0	…	-1	1	0

Note: The table shows part of a design matrix for one respondent. For sake of presentation, ellipses indicate rows/columns of the complete design matrix that are not shown in the table.

Data were analyzed using a hierarchical linear model implemented in the *bayesm* package of the R statistical computing language (Rossi, 2015). As discussed above, the analysis yielded a two-level model consisting of an aggregate-level model that treated all survey respondents homogenously, and an individual-level model that estimated utilities (also referred to as part-worths) for every individual respondent. The individual level enables more fine-grained QoL predictions for specific demographic segments within the sample. Therefore, that model was the focus of the present analysis. Results related to the aggregate model are included for archival purposes in Appendix B.

3.4. Individual-Level QoL Modeling

This section presents the results of the individual-level QoL model. After presenting an analysis of how well the model fit the survey data, the part-worths for each attribute will be presented along with supporting statistical analysis. The final part of the section provides an analysis of the difference between attributes in part-worth and the associated impact of each attribute on predicted QoL.

3.4.1 Assessing Model Fit

Fit of the individual-level QoL model was assessed using three methods that will be described below. For model-fitting purposes, a "training" data set was formed by randomly selecting 25 of the 30 discrete choice responses from each participants' survey data. The remaining five trials formed a "validation" data set.

The first method of assessing model fit was an "internal" assessment of fit between observed and predicted responses within the training data. This assessment simply addressed whether the hierarchical model provided an adequate fit to the data used to construct it. Fit statistics (R^2 and root mean square error, or RMSE) were calculated for each survey participant using each Soldiers' choice data from the training data set and the corresponding individual coefficients from the regression model.

The second method of assessing fit was an "external" assessment of fit between observed responses in the validation data set and predictions generated by the model. This assessment addressed whether model predictions could generalize to new data that were not used to fit the model. Fit statistics (R^2 and RMSE) were calculated for each survey participant using each Soldiers' choice data from the validation data set and the corresponding individual coefficients from the regression model.

The third method of assessing model fit was a comparison between survey participants' monadic rating of QoL at the camp they spent the most time at during their most recent deployment and the model's prediction of the QoL at those real-world camps. Recall that the survey asked Soldiers to describe the camp they spent the most time at by choosing the level of each camp attribute that most closely resembled their experience. They also rated the overall QoL of that camp on a 0-100 scale. If the QoL model was able to predict those responses it would provide converging evidence that the model has predictive validity outside of the discrete choice data collected in this survey. For this third measurement of fit, a predicted aggregate QoL was computed for each survey participant by coding their responses on the camp experience section of the survey to determine what level of each attribute they experienced. Attribute levels were

coded as either 0 or 1 depending on whether the Soldier did not experience that level or did experience it, respectively. This coding scheme produced a vector for each Soldier describing his or her specific camp experience. This vector was multiplied by a vector of scaled model coefficients for the corresponding individual, and the resulting product was summed to yield an overall predicted QoL score for that particular camp. To generate corresponding scales between the 0-100 scale used in the camp description section of the survey and the model predictions, the model coefficients for each individual were scaled such that a "perfect" QoL score of 100 would correspond to having the best level of each attribute for that particular Soldier. To achieve this scaling, the level with the highest coefficient was identified for each attribute. This set of highest levels was summed for across all 84 attributes, and used to normalize all of the coefficients for that individual. The normalized coefficients were then multiplied by 100. The result was a set of scaled coefficients that fell within the same 0-100 scale used in the camp description section of the survey. The fit between the resulting predicted scores and observed survey responses was assessed via R^2 and RMSE.

Method 1: Observed vs. predicted responses within the training data set

Internal fit was quite high. Across all respondents, R^2 ranged from 0.96 to 0.99 with a median of 0.98. To assess whether fit depended on individual differences among the Soldiers, Kruskal-Wallis one-way ANOVA was used to determine if demographic variables of gender, rank, or MOS influenced model fit. For purposes of this analysis, rank was coded as having three levels: junior enlisted (covering ranks E1 through E4), senior enlisted (covering ranks E5 through E9) and office (covering all officer ranks). MOS was coded as a two-level factor: combat (covering all combat arms and front-line MOS, including infantry, combat medics, combat engineers, etc.) and support (covering all combat service and combat service support MOS). Neither gender ($K(1) = 0.30$, $p = 0.58$) nor MOS ($K(1) = 3.31$, $p = 0.06$) had a significant effect on fit. However, rank did have an effect, $K(2) = 6.35$, $p < .05$. Post-hoc testing using the Wilcoxon-Mann-Whitney test[1] found that fit was slightly better for data generated by officers ($M = 0.988$, $SD = 0.005$) compared with fit for data generated by senior enlisted ($M = 0.986$, $SD = 0.005$; $W = 28{,}741$, $p < .05$) or junior enlisted ($M = 0.986$, $SD = 0.005$; $W = 31{,}597$, $p < .05$). Senior and junior enlisted did not differ ($W = 155{,}450$, $p = 0.44$).

In addition to the generally high R^2 values, RMSE was low, ranging from 0.04 to 0.69, with a median of 0.17 across respondents. Kruskal-Wallis tests for effects of gender, rank, and MOS were non-significant: for gender, $K(1) = 0.12$, $p = 0.73$; for rank, $K(2) = 0.18$, $p = 0.92$; and for MOS, $K(1) = 1.74$, $p = 0.19$, suggesting that RMSE was not different across demographic segments.

Taken together, the R^2 and RMSE results suggest that the QoL model fit the survey response data well. There was some compression in the predicted values, as shown in Figure 8. Specifically, predictions tended to undershoot observed values at the extreme ends of the response scale.

[1] The Wilcoxon-Mann-Whitney test (also referred to as the Wilcoxon signed rank test or Mann-Whitney test) evaluates the null hypothesis that two empirical samples are drawn from the same distribution. Unlike the t-test, Wilcoxon-Mann-Whitney does not assume that the samples are normally distributed. The test produces a W statistic, with lower values indicating a lower probability that the samples were drawn from the same distribution.

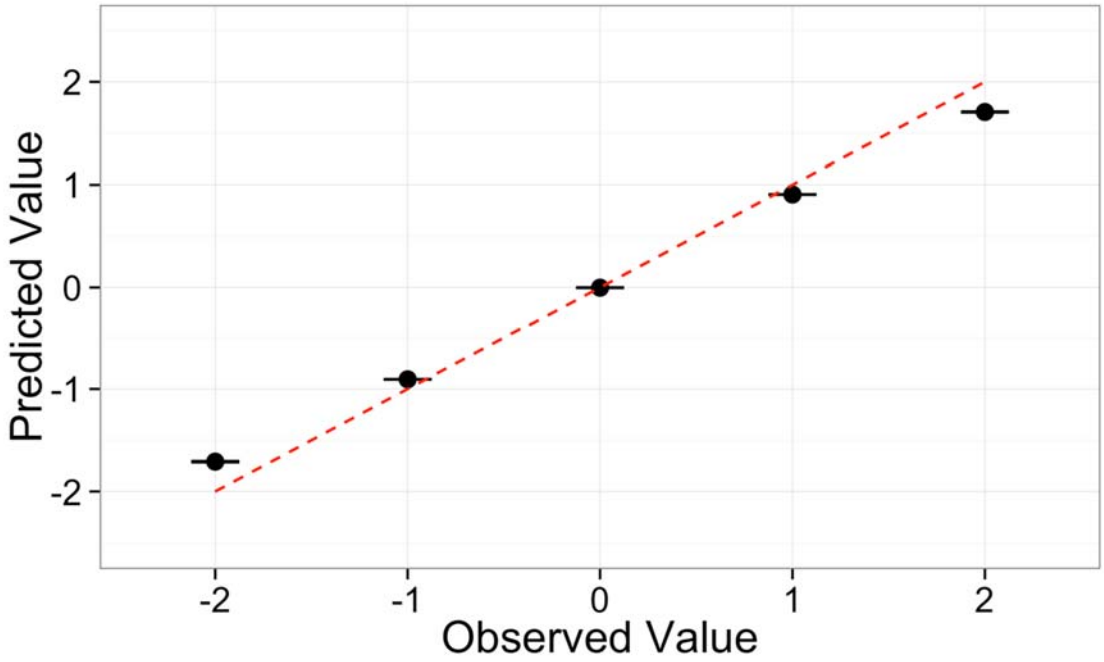


Figure 8. Predicted vs. observed choice responses for data from the training set. The horizontal bars bisecting each point are 95% confidence intervals (CIs) for the mean predictions. The CI's were very small, which is why there appears to only be one line passing through each point.

Method 2: Predicted responses vs. observed responses from the validation data set

The model also did an effective job at forecasting survey responses from the validation data set. The R^2 between responses predicted by the model and observed choices included in the estimation set ranged from 0.01 to 0.99 across respondents, with a median of 0.35. While lower than the R^2 values associated with the training data set, a median R^2 of 0.35 is still quite good for survey data, and corresponds to a large effect size by standards used throughout the social sciences (Cohen & Cohen, 2002). There was little indication that sample demographics influenced R^2. Kruskal-Wallis tests for gender, rank, and MOS were non-significant: for gender, $K(1) = 0.35$, $p = 0.55$; for rank, $K(2) = 2.36$, $p = 0.31$; and for MOS, $K(1) = 0.25$, $p = 0.62$. RMSE for the validation data ranged from 0.19 to 3.05, with a mean of 1.06. Kruskal-Wallis tests for RMSE as a function of gender, rank, and MOS were also non-significant: for gender, $K(1) = 0.54$, $p = 0.46$; for rank, $K(2) = 0.54$, $p = 0.76$; and for MOS, $K(1) = 0.14$, $p = 0.71$.

As with the training data set, model predictions for the validation set undershot observed data at extreme ranges of the response scale (Figure 9). However, the pattern was far more pronounced, as would be expected given the lower correlation between observed and predicted values for the training set. However, the critical observation is that fit varied widely across participants, and that for over half of the sample it ranged from very good to almost perfect. The take-away is that efforts to use this model for predicting QoL must include the choice of a cutoff for participant coefficients to include in the analysis. As a rule of thumb, it is recommended to include only coefficients for participants with R^2 greater than or equal to the median value of 0.35 and RMSE less than or equal to the median value of 1.06. NSRDEC has developed a Microsoft Excel-based tool that implements the QoL model that will follow this criterion.

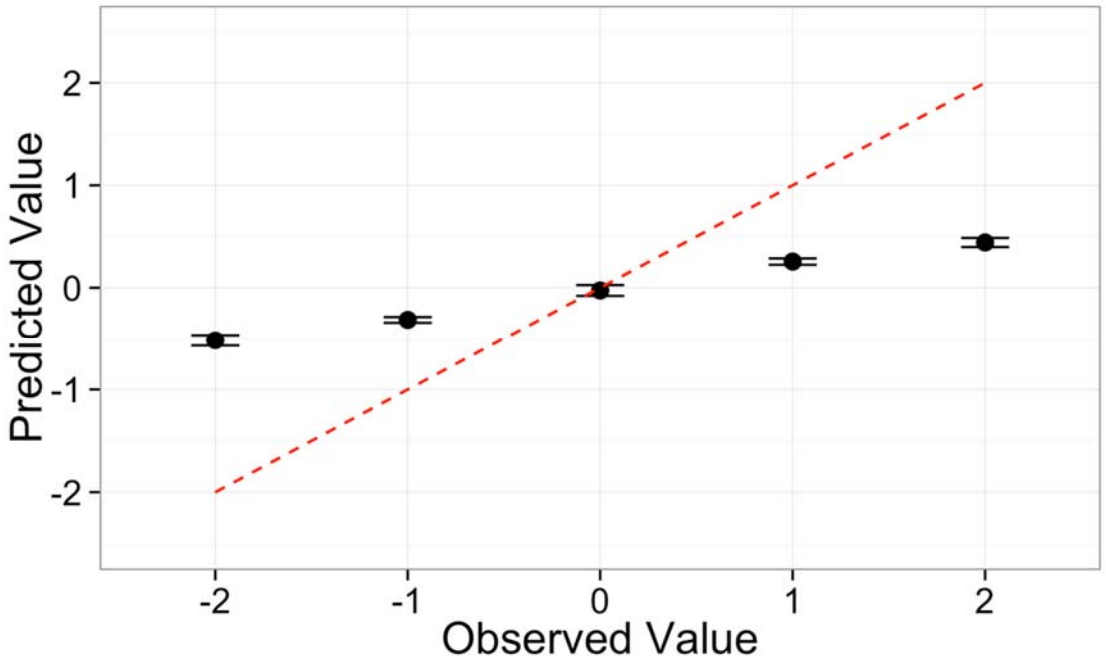


Figure 9. Predicted vs. observed choice responses for data from the validation set. The horizontal bars bisecting each point are 95% CIs for the mean predictions.

Method 3: Predicted responses vs. Soldier ratings of real-world camps

The final method for assessing the fit of the QoL model involved comparing Soldier ratings of the QoL afforded by real-world camps they experienced with the predicted QoL for those camps as given by the model. The approach for this analysis is described above. Overall, the fit between Soldier ratings of the camps they experienced and the predictions given by the model was good. The correlation between the ratings Soldiers gave to their camps and the QoL scores predicted by the model was $r = 0.56$, which was statistically significant, $t(1225) = 23.8785$, $p < .01$, and corresponded to a R^2 of 0.32. The RMSE for the predicted QoL scores was 18.85.

Taken together, the three methods for assessing fit of the individual QoL model point to a promising conclusion. Fit within the training data set was excellent, which was by no means guaranteed given the complexity of the model being fit. Fit between predicted values and observed data from the validation data set was also acceptable, with a large effect size by the standards of survey data. Similarly, the model did a good job predicting monadic ratings of the QoL of real-world camps, as rated by the Soldiers participating in the survey. The fact that this latter measure of fit was significant is particularly encouraging given that the model was predicting QoL scores that were generated through a different item response modality (i.e., monadic responses from an analog response scale versus choice data from a discrete choice task).

3.4.2 Model Results

Analysis of the modeling results focused on answering two primary questions. First, which base camp attributes have the greatest impact on QoL? Put differently, which are most important to Soldiers, and should be maximized within the limits of operational conditions and logistical constraints? Second, what incremental changes in QoL can be expected for changes in the levels

of each attribute? If the levels of a particular attribute are arranged in order from worst to best QoL, are there some changes that lead to relatively large improvements in QoL, while other changes lead to minimal improvements? These questions speak to the essential foundations of Soldier QoL and identify those attributes and service levels that are most crucial for deployed Soldiers.

The first step in conducting this analysis was to compute the mean part-worth associated with the best level of each attribute (i.e., the level with the highest part-worth). Then, the data were ordered from highest to lowest, yielding a rank-ordered list of attributes by part-worth. Using this list, a set of Bonferroni-corrected t-tests was run between successive pairs of attributes. This approach balanced the desire to understand whether attributes differed with the risk of over-correcting for Type I error.

The results are presented in the following series of Figures 10 through 13, which present the QoL scores arranged from greatest to least impact on QoL. To simplify interpretation, the part-worths for each attribute have been rescaled as percentages of the sum of the best level for each individual attribute. The figures also provide information on which pairs of attributes were statistically different.

There are a few key points that emerge from this analysis. First, there appears to be a cluster of six attributes that can individually provide a QoL improvement of over 2%. Specifically, the kind of body armor worn inside the wire had the greatest overall impact on QoL, with a 2.68% improvement in QoL seen in moving from the worst level (IOTV with front, back, and side plates) to the best level (no armor). In addition, the type of bed, shower frequency, billet temperature, number of people sharing living space, and range of PX/AAFES goods all yielded an improvement of over 2%. In contrast, 30 of the attributes had a less than 1% contribution to QoL. Of course, in aggregate the combination of these attributes has a large effect on QoL. However, it should be possible to reduce service level of some of these attributes without having a severe effect on QoL. The question of what is an acceptable QoL standard is, of course, subjective.

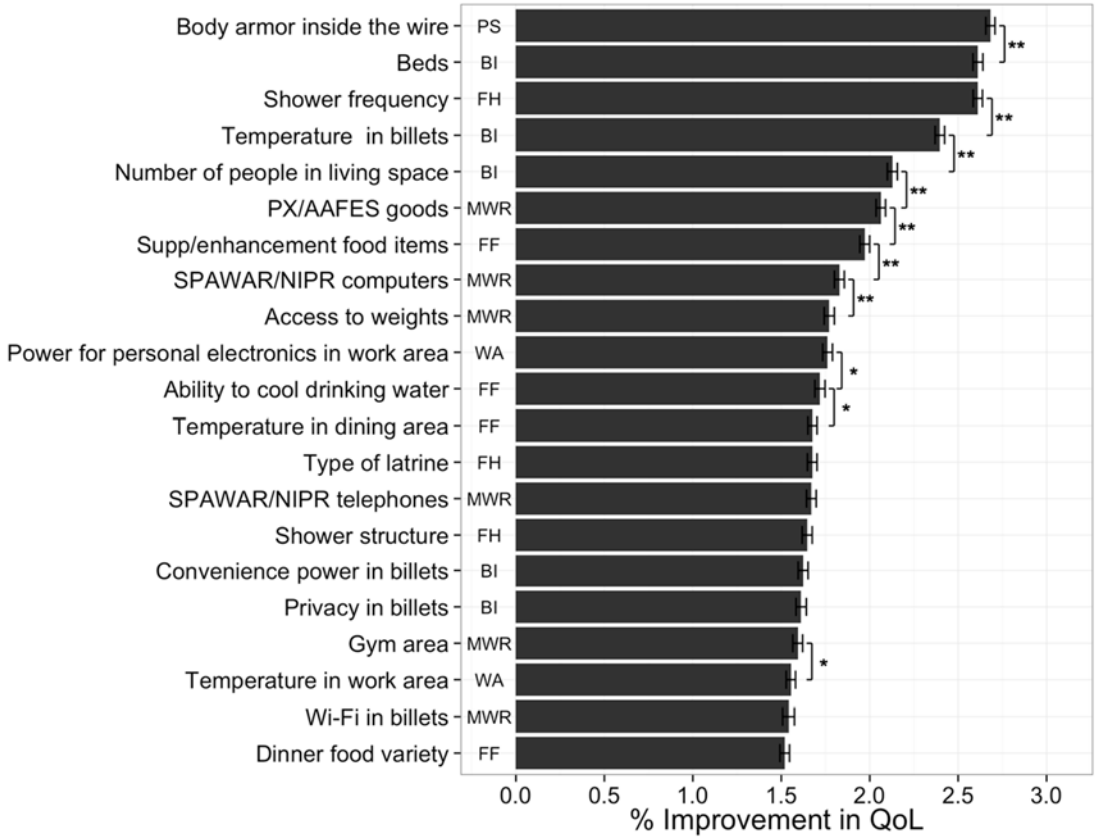


Figure 10. Improvement in QoL for attributes in the 75th percentile of estimated part-worth utility. Significant differences between successive attributes are indicated by single ($p < .05$) and double ($p < .01$) asterisks.

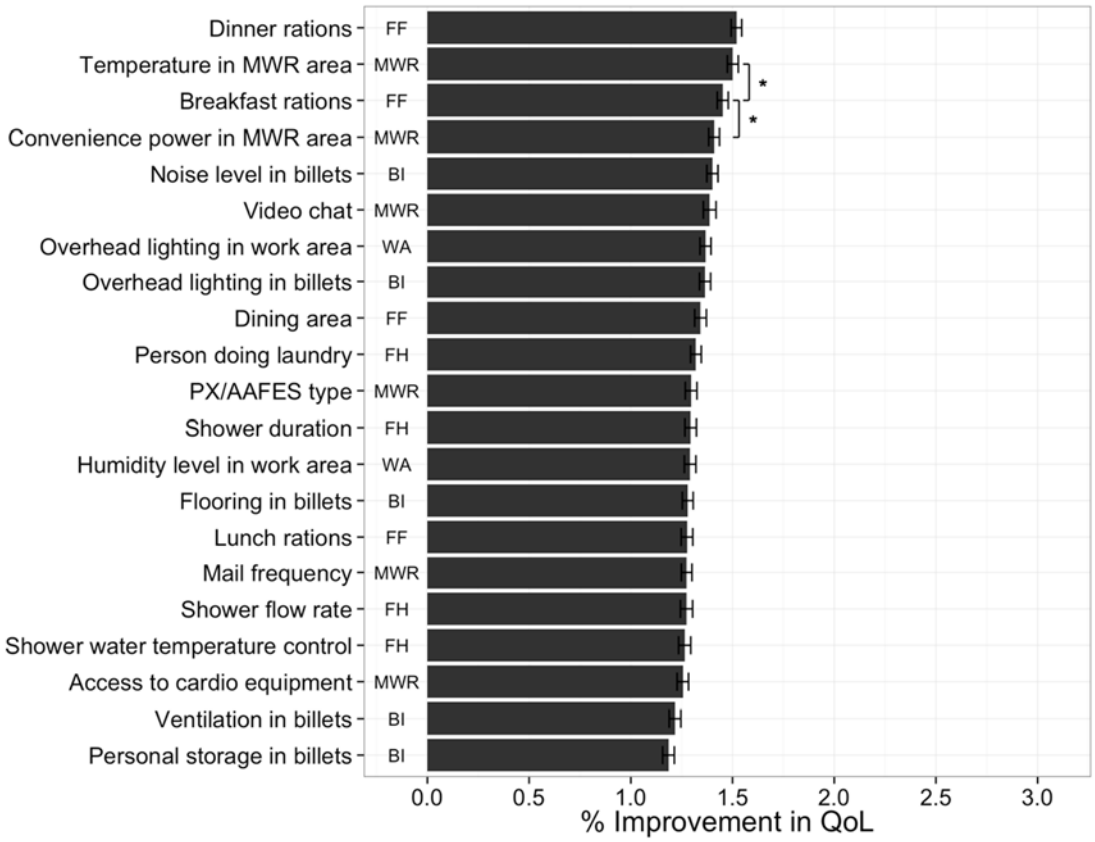


Figure 11. Improvement in QoL for attributes in the 50th to 75th percentile of estimated part-worth utility. Significant differences between successive attributes are indicated by single ($p < .05$) and double ($p < .01$) asterisks.

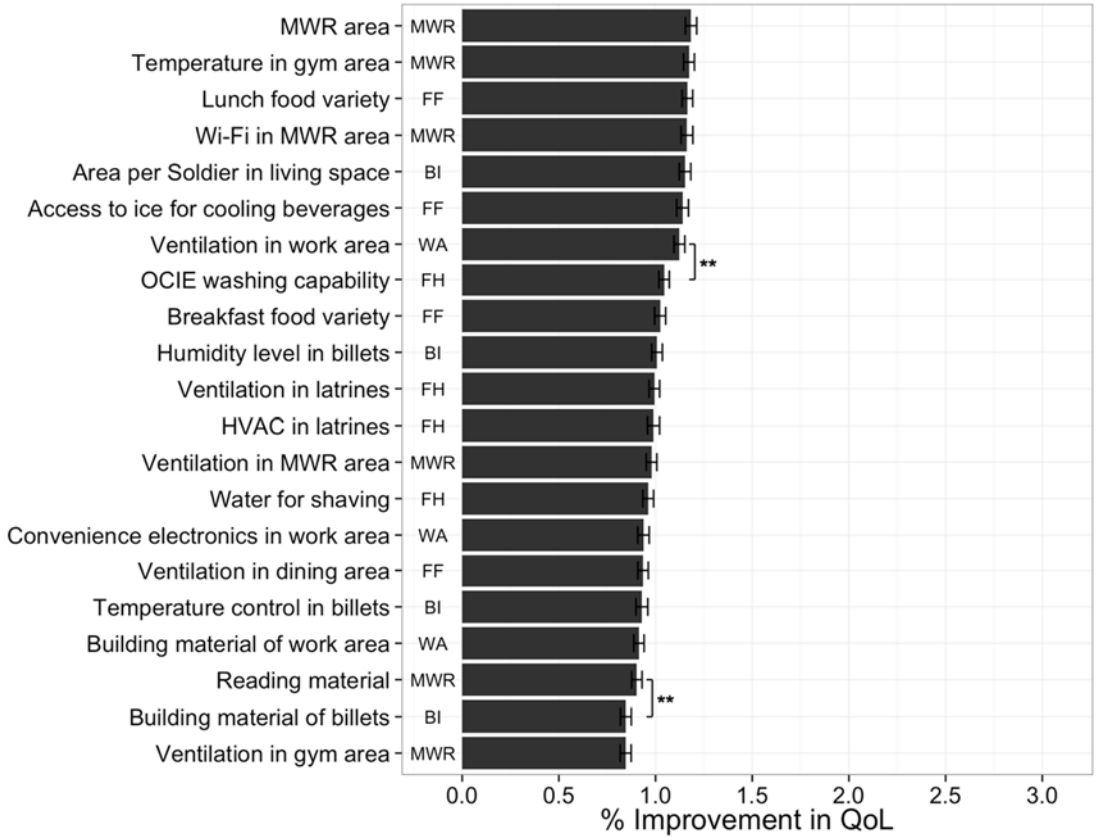


Figure 12. Improvement in QoL for attributes in the 25th to 50th percentile of estimated part-worth utility. Significant differences between successive attributes are indicated by single ($p < .05$) and double ($p < .01$) asterisks.

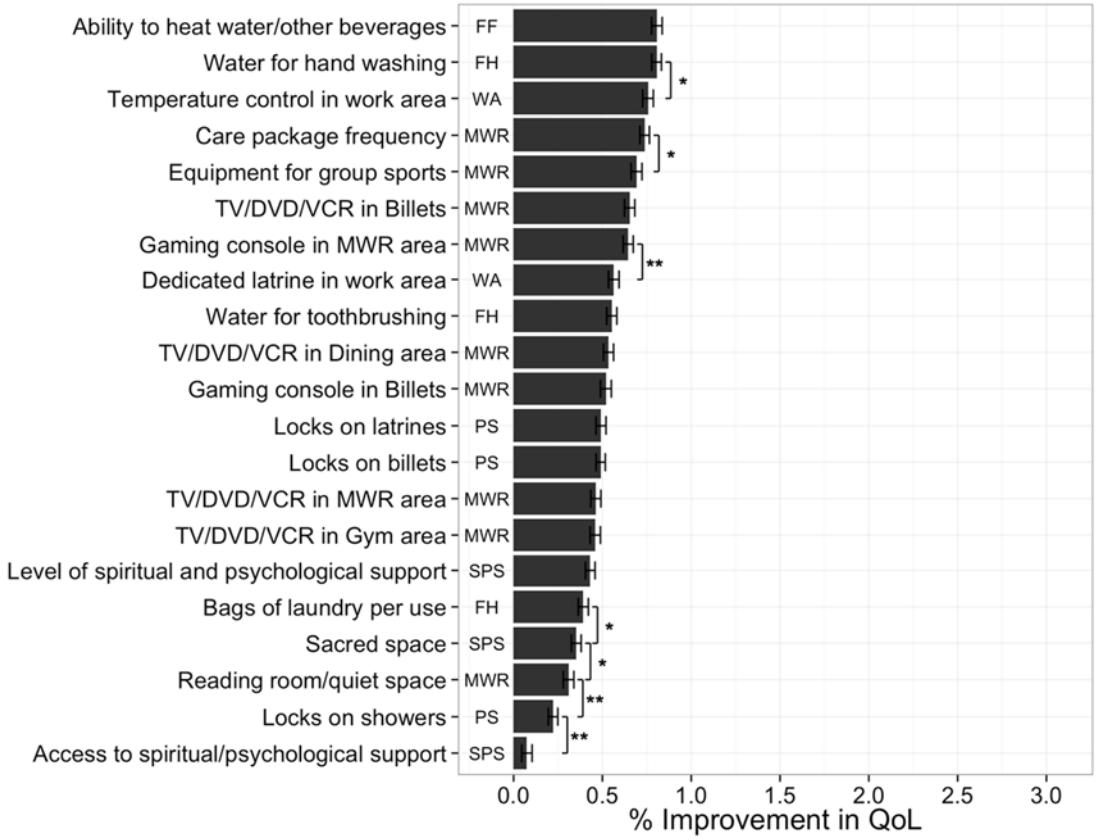


Figure 13. Improvement in QoL for attributes in the 25th percentile of estimated part-worth utility. Significant differences between successive attributes are indicated by single ($p < .05$) and double ($p < .01$) asterisks.

The preceding results speak to the relative importance of each attribute in contributing to overall QoL. The second key analysis question involved looking at each attribute in detail to determine the incremental improvements that can be obtained by improving conditions from one level to the next. This analysis is important for informing tradeoff analysis, because if two levels of a particular attribute are statistically identical from a QoL standpoint, but one has significantly greater fuel, water, or waste demands, it should be possible to improve the efficiency of the camp without impacting QoL by choosing the less resource-intensive attribute level. Conversely, if there are certain levels that are clearly superior in QoL to other levels within a particular attribute, it would be beneficial to protect them to preserve Soldier QoL.

The attribute level analysis involved running an ANOVA for every attribute with level, gender, MOS, rank, the camp size each Soldier had the most experience with (fewer than 50 total personnel, 51-300 personnel, 301-1000 personnel), and work location (primarily inside the camp vs. outside the camp) as factors. The inclusion of the demographic and camp experience factors was intended to determine if any of these individual variables significantly influence how Soldiers perceive QoL. For example, Soldiers with the most experience operating out of camps housing 301-1,000 personnel might rate extremely austere conditions lower in QoL relative to Soldiers who are used to operating out of camps housing fewer than 50 personnel. In essence, the hypothesis is that QoL is, to some degree, a matter of individual experience and perspective.

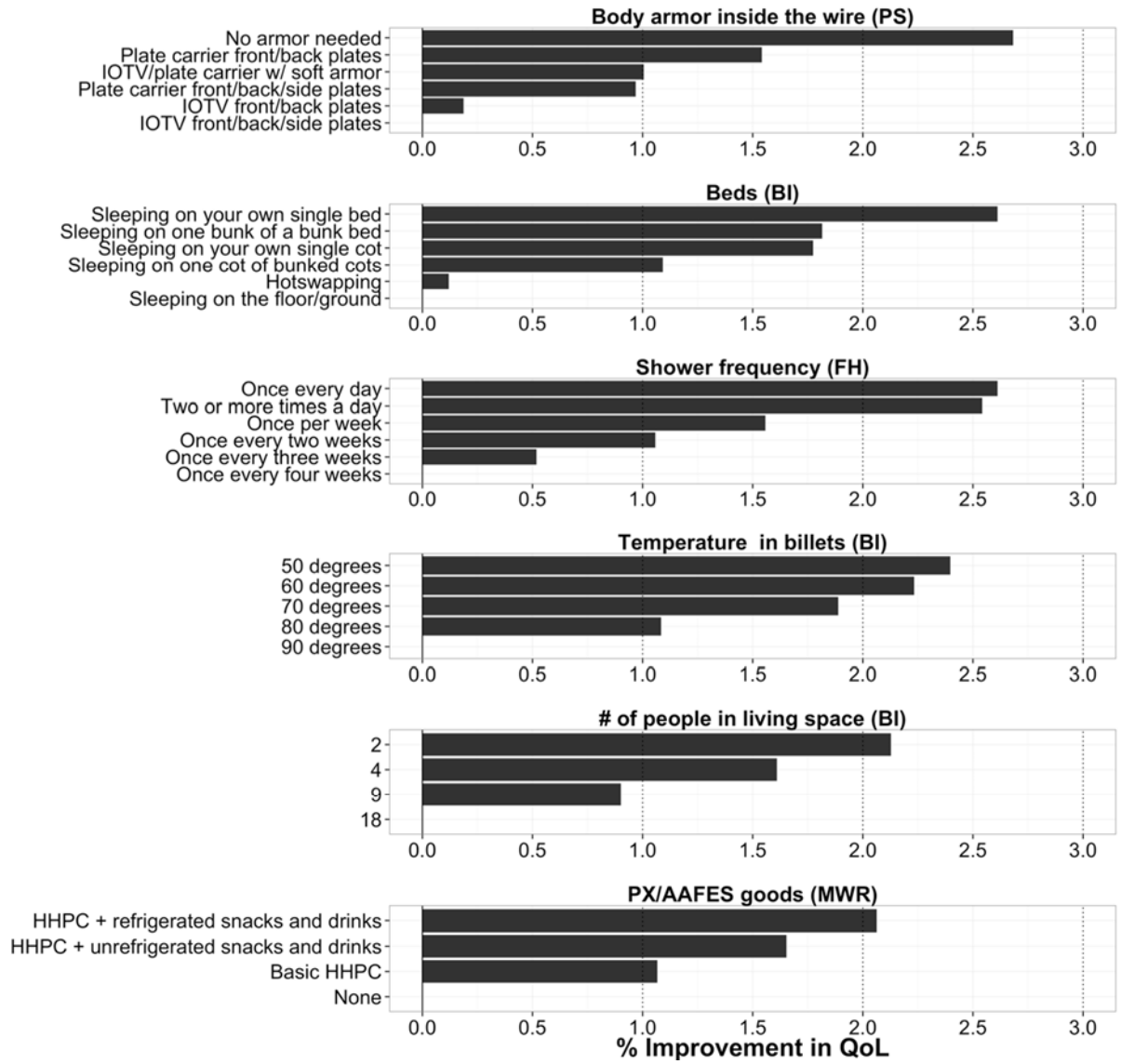
As one might imagine, this analysis produced a very large amount of output. For archival purposes, the full results of these ANOVAs, along with all appropriate post-hoc comparisons, can be found in Appendix C. The remainder of this section will focus on summarizing the key results from the attribute level analysis.

To that end, Figures 14 through 27 present the QoL utility of the levels of every attribute. Each figure presents a subset of six attributes, each in its own subplot. The attributes are presented in descending order of maximum QoL impact, beginning with the attribute which has the greatest impact on QoL (body armor inside the wire). These figures show the relative improvement in QoL that can be expected for each level of every attribute. For example, Figure 14 begins with the attribute "body armor inside the wire" and lists the associate levels which are: IOTV front/back/side plates, IOTV front/back plates, plate carrier front/back/side plates, IOTV/plate carrier with soft armor, plate carrier front/back plates, and no armor needed. The biggest increase between attribute levels occurs when the body armor inside the wire changes from plate carrier front/back plates to no armor needed. This result is consistent with what would be expected of Soldiers to report. Body armor is often described as uncomfortable and cumbersome. Therefore, not having to wear body armor within the perimeter of a base camp should increase Soldier QoL.

Several of the attributes with the most potential to contribute towards a Soldier's QoL fall within the functional area of billeting. The type of bed Soldiers are provided clearly has a major impact on QoL (Figure 14), and QoL can be improved by 2.61% by giving Soldiers their own bed. In lieu of a personal bed, sleeping on a bunk bed or individual cot were seen as equivalent alternatives. It is interesting to note that there was not a great increase in QoL from sleeping on the ground to hot swapping[2] with another Soldier. This might suggest that having to share a bed with another Soldier is not much better or more desirable than sleeping on the ground.

The other top contributors to Soldier QoL within billeting are temperature in the billets and number of people sharing a living space (Figure 14). The results show that simply lowering the temperature within the billets from 90 to 80 °F has a large impact on QoL. Of course, this could have an implication for fuel usage if the camp is located in a hot environment, if the shelter is not adequately insulated, or if HVAC units are not efficient. In addition, reducing the number of occupants in a living space has a significantly positive impact on QoL. Soldiers preferred sharing their living space with just one other Soldier (a gain of 2.13%), but both 4-Soldier and 9-Soldier quarters also provided significant gains over standard shelter capacities of 18 Soldiers. This is an interesting finding if one considers the second-order effects of reducing billet capacity. For example, if billets were configured to house a 9-man squad there is the potential to turn off HVAC when they are on duty, because they should share the same duty cycle. This would both improve QoL over the baseline and potentially save fuel.

[2] Hot-swapping refers to two or more Soldiers sharing a single bed, sleeping in shifts.



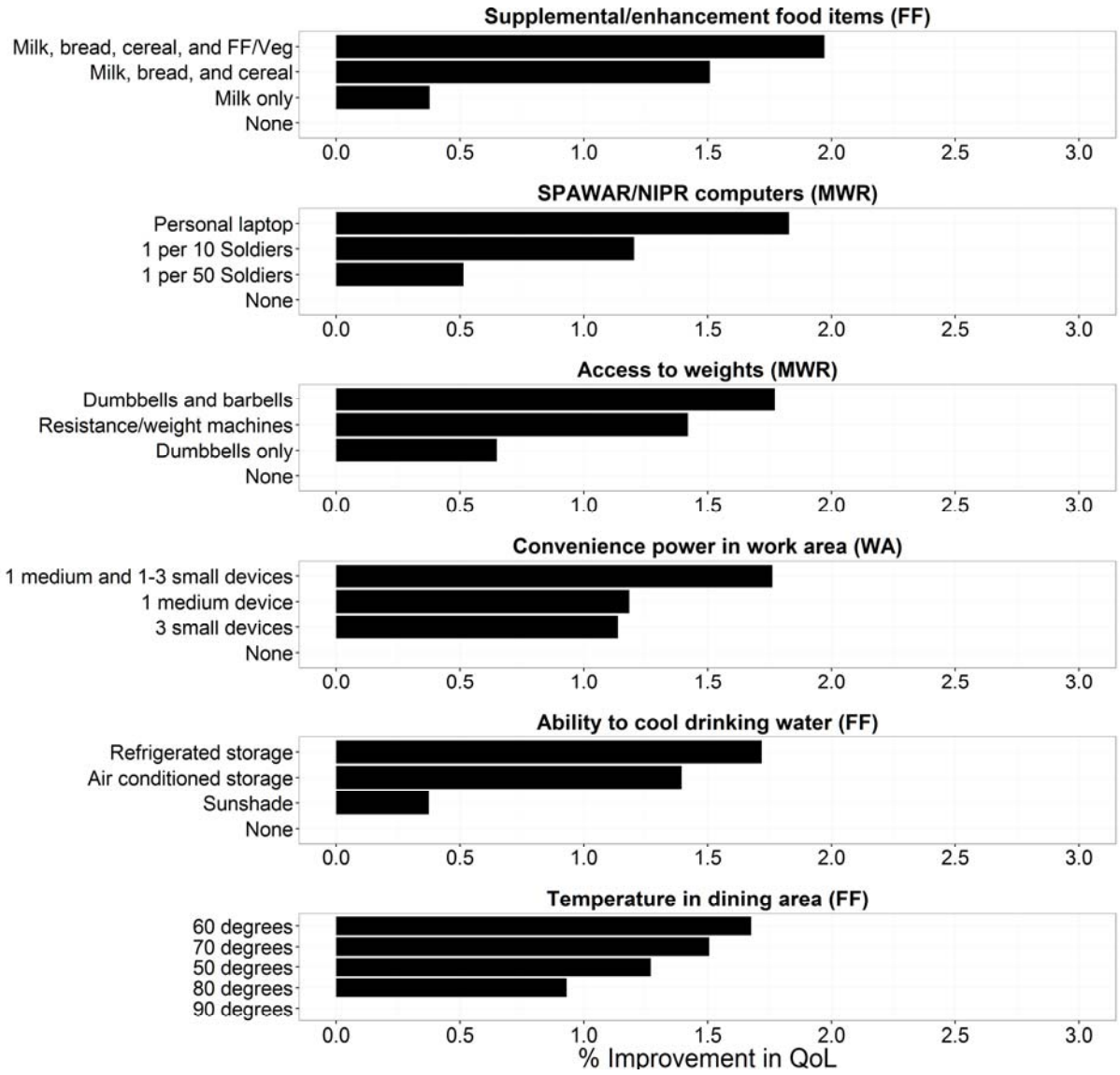
Note: Each subplot shows the improvement in QoL that can be achieved with each level of a single attribute. The name of the attribute and its family are shown above each subplot: FF = Field Feeding; FH = Field Hygiene; BI = Billets; MWR = Morale, Welfare, and Recreation; SPS = Spiritual & Psychological Support; WA = Work Area; PS = Personal Security.

Figure 14. Percent improvement in QoL for levels of six attributes: body armor inside the wire, beds, shower frequency, temperature in billets, number of people in living space, and PX/AAFES goods.

Within the functional area of field feeding the range of supplemental and enhancement food items was seen by Soldiers as very important for QoL (Figure 15). In particular, Soldiers strongly preferred having bread, cereal, and fresh fruits and vegetables available at their camp. Fresh fruits and vegetables are likely superior to canned options from a nutritional standpoint, but also require logistics, storage, and preparation capabilities that are not typically part of the design of small and extra small camps. This might be an area in which sacrificing some fuel, water, and waste efficiency might lead to a worthwhile improvement in Soldier QoL (and

possibly health). From a ration perspective, having something other than a MRE was most important for dinner, followed by breakfast (Figure 17). At both of these meals, Soldiers would prefer eating something other than a combat ration (e.g., a meal prepared "from scratch"), though UGR-As appear to be an acceptable alternative for both meals (and an equivalent option for breakfast). Lunch rations are less important from a QoL standpoint, though Soldiers still prefer something other than MREs (Figure 19). UGR – H&S rations fared relatively better against other ration types for lunch, suggesting that Soldiers might prefer expediency at lunch time over something resembling a more traditional meal. Taken together, these results suggest that the Army should try to provide fresh fruits and vegetables to as many camps as possible, regardless of size. In addition, efforts should be made to provide at least one non-ration meal every day, ideally at dinner. While both of these practices would have a fuel, water, and waste impact, in concert these two steps would improve QoL by 3.49%. Is that a significant enough improvement in QoL to offset the logistical and resource burden? Unfortunately, that is not a question that any set of data can answer. Instead, Army leadership will have to determine how much QoL gains for Soldiers are worth.

Turning to hygiene, shower frequency was very important. QoL can improve by 2.61% by letting Soldiers shower at least once per day (Figure 14). Shower duration was less important, with anything over a 2-min shower providing a significant QoL boost (Figure 19). This suggests that shower management at base camps should emphasize frequency over duration. Soldiers do not appear to mind enforced short showers, as long as they can have one every day. Having flush toilets and shower systems with privacy was also important (Figure 16). This suggests that Force Provider-like containerized latrine systems should be deployed as widely as possible. For example, giving Soldiers at least one shower a day in a private shower unit boosts QoL by over 4.26%. As with food, the question of whether this improvement is worth the resource costs is a question of doctrine and policy. However, the present data should be able to inform doctrine by enabling leadership to compare QoL with resource demands on a quantitative level.



Note: Each subplot shows the improvement in QoL that can be achieved with each level of a single attribute. The name of the attribute and its family are shown above each subplot: FF = Field Feeding; FH = Field Hygiene; BI = Billets; MWR = Morale, Welfare, and Recreation; SPS = Spiritual & Psychological Support; WA = Work Area; PS = Personal Security.

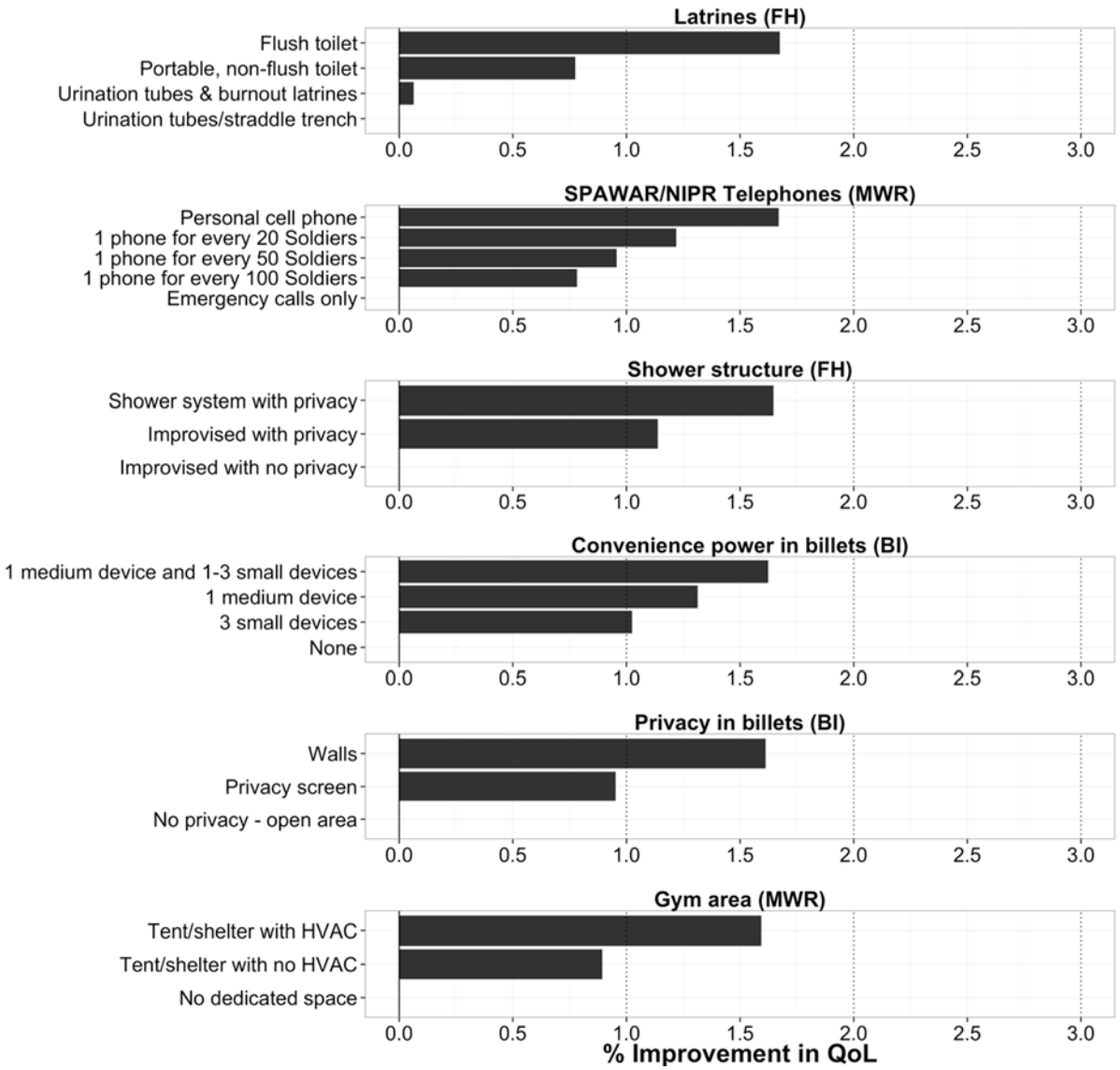
Figure 15. Percent improvement in QoL for levels of six attributes: supplemental/enhancement food items, SPAWAR/NIPR computers, access to weights, convenience power in work area, ability to cool drinking water, and temperature in dining area.

In the MWR space, Soldiers viewed the type of goods available in a base camp PX/AAFES as important for their QoL, with the biggest increase in QoL associated with having access to a PX that carries basic health, hygiene, and personal care items (Figure 14). Adding refrigerated or unrefrigerated snacks and drinks is also beneficial, though the incremental improvement is relatively smaller. In conversations with Soldiers at multiple installations, the research team learned that the Army does not provide Soldiers with toothpaste, shampoo, deodorant, and other hygiene/personal care items. Soldier are expected to either purchase these items on their own

from a PX/AAFES or local market, or have them shipped in care packages. Given this practice, is it understandable that Soldiers would highly value having access to a shoppette. In lieu of providing regular PX/AAFES access, the Army should consider other procedures for ensuring Soldiers have a steady supply of basic hygiene and personal care items. While many Soldiers receive these goods in care packages, not every Soldier has this level of support back home, and care package frequency can be irregular in a combat environment.

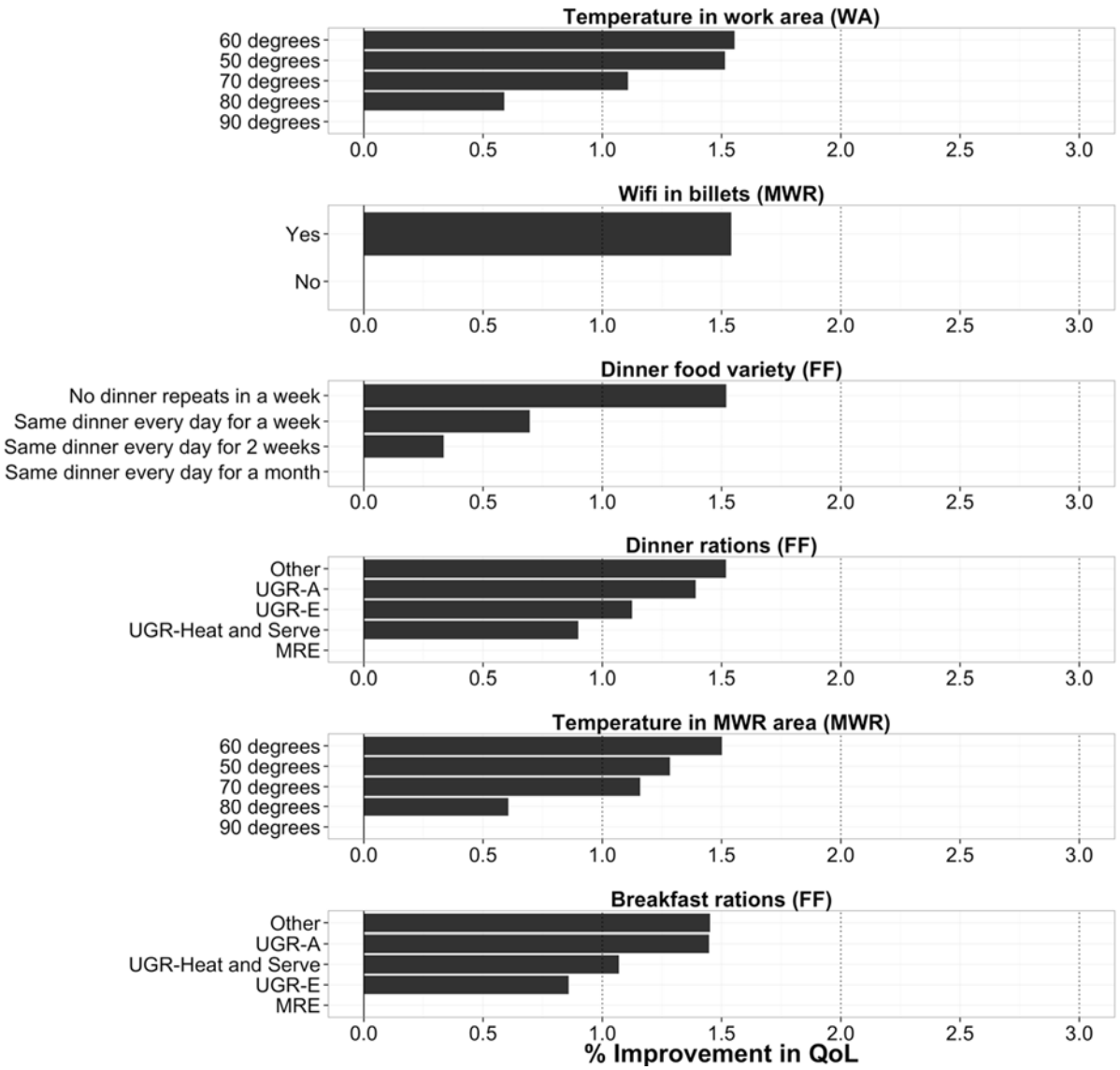
In addition to PX/AAFES variety, Soldiers also viewed gym capabilities as critical for their QoL. Access to weights was vital (Figure 15). Dumbbells and barbells were the preferred option for weights, with resistance machines a close second. However, even a basic set of dumbbells improved QoL to some extent (approximately 0.65%). Access to cardio exercise equipment was seen as less important (Figure 20). Providing a dedicated, climate-controlled shelter for a gym, with dumbbells and barbells, improves QoL by approximately 3.36% (Figure 16). In fact, having a dedicated gym was seen as more important than having a dedicated MWR facility (Figure 21) or dining area (Figure 18). This suggests that base camp planners might improve QoL by prioritizing the deployment of a gym shelter when considering capabilities to establish or improve a camp.

Many of the attributes in the spiritual/psychological support, personal security, and work area domains were less important individually, but could potentially combine to boost QoL. In fact, one of the key insights from this study is that it may be possible to compensate for low QoL in some aspects of a camp by providing compensating packages of other capabilities. For example, suppose it is impossible to house fewer than 18 Soldiers in a shelter. This equates to a potential loss in QoL of up to 2%. However, if the shelter has privacy screens (adds around 1%; Figure 16) and either rigid flooring (adds around 1.1%; Figure 19) or a wall locker for every Soldier (add around 0.8%; Figure 20), it might be possible to preserve QoL even in tightly-packed quarters. Adding screens and rigid flooring has minimal impact on fuel, water, or waste, but can provide a boost in QoL.



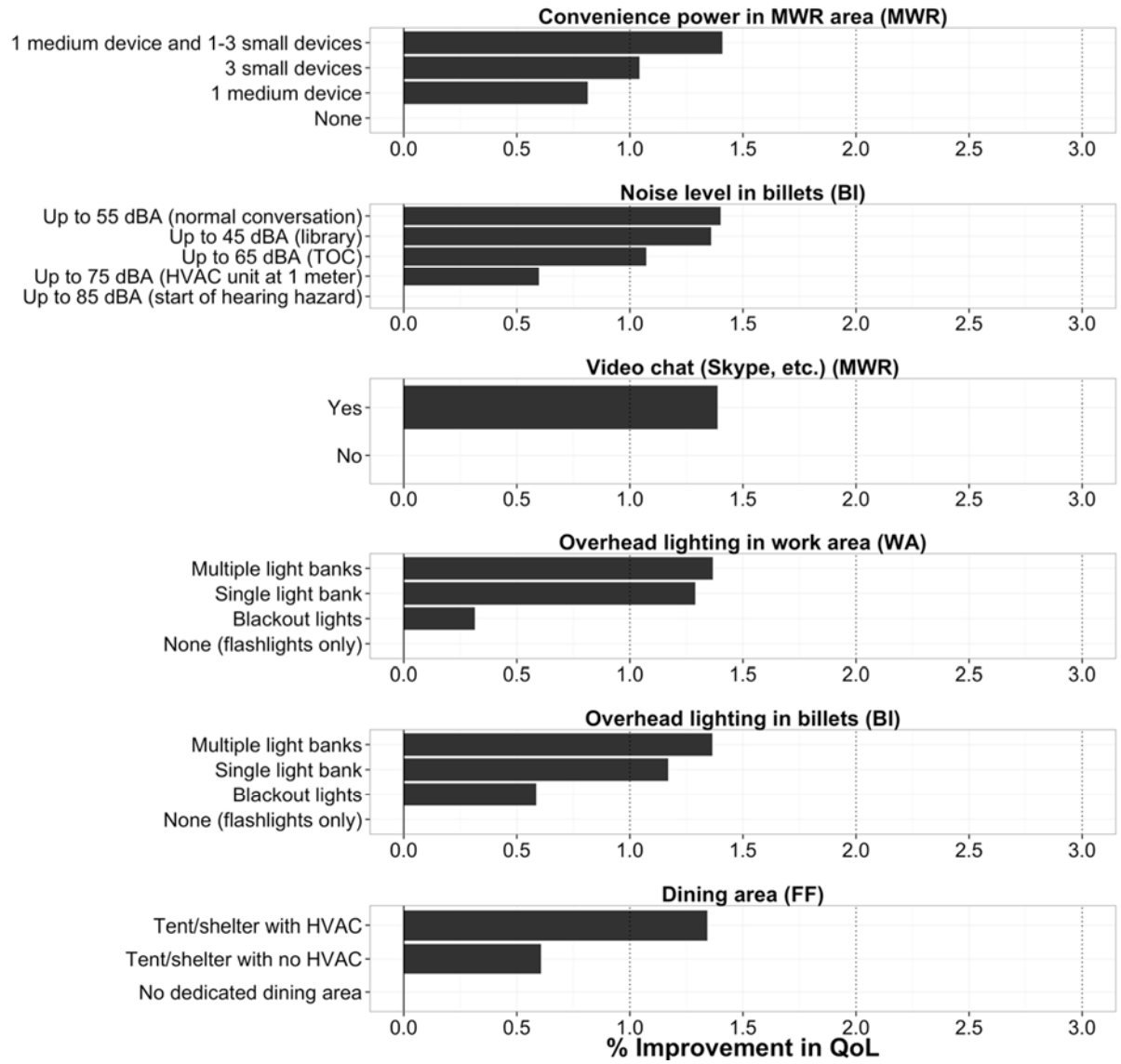
Note: Each subplot shows the improvement in QoL that can be achieved with each level of a single attribute. The name of the attribute and its family are shown above each subplot: FF = Field Feeding; FH = Field Hygiene; BI = Billets; MWR = Morale, Welfare, and Recreation; SPS = Spiritual & Psychological Support; WA = Work Area; PS = Personal Security).

Figure 16. Percent improvement in QoL for levels of six attributes: latrines, SPAWAR/NIPR telephones, shower structure, convenience power in billets, privacy in billets, and gym area.



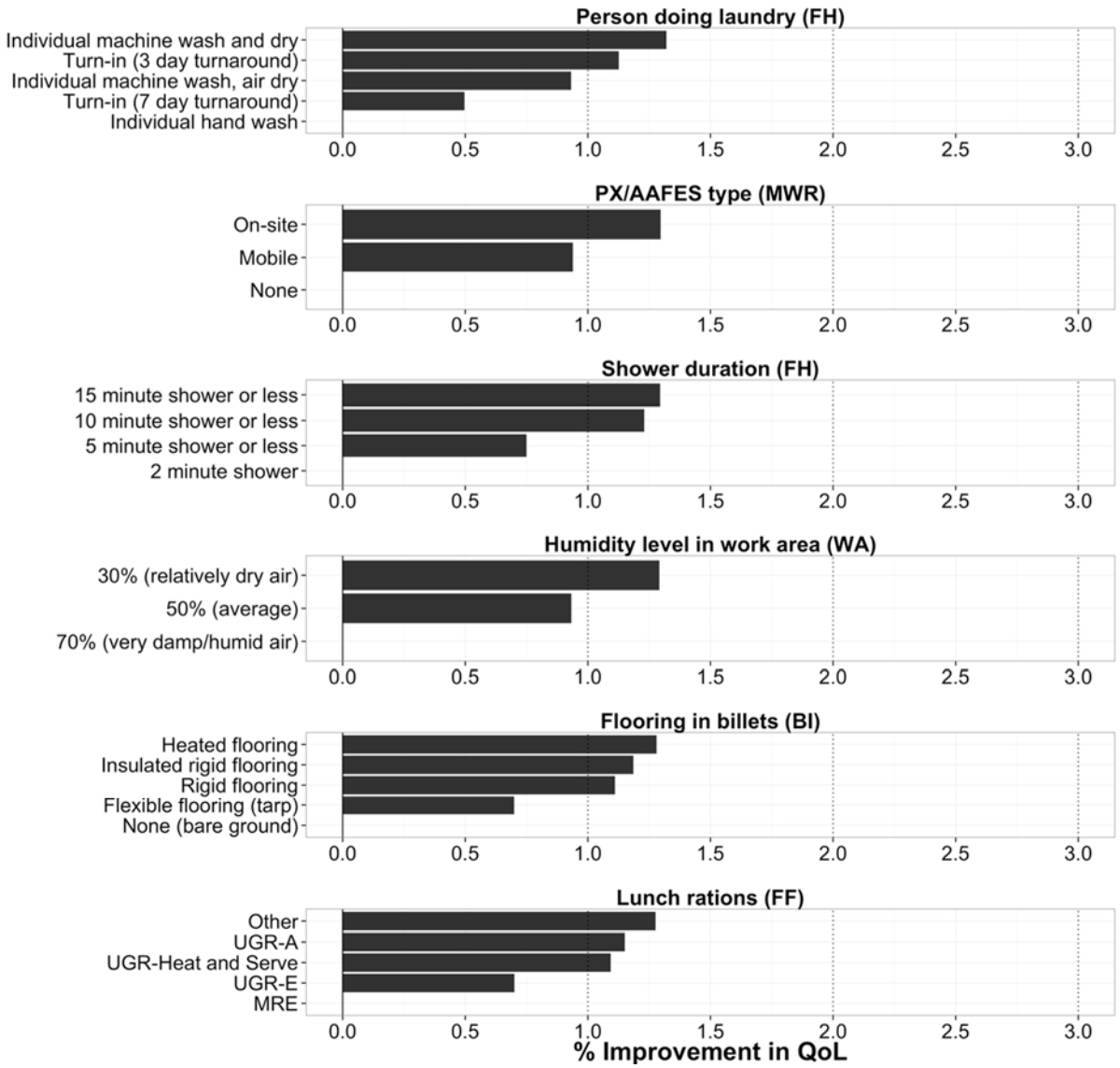
Note: Each subplot shows the improvement in QoL that can be achieved with each level of a single attribute. The name of the attribute and its family are shown above each subplot: FF = Field Feeding; FH = Field Hygiene; BI = Billets; MWR = Morale, Welfare, and Recreation; SPS = Spiritual & Psychological Support; WA = Work Area; PS = Personal Security.

Figure 17. Percent improvement in QoL for levels of six attributes: temperature in work area, WiFi in billets, dinner food variety, dinner rations, temperature in MWR area, and breakfast rations.



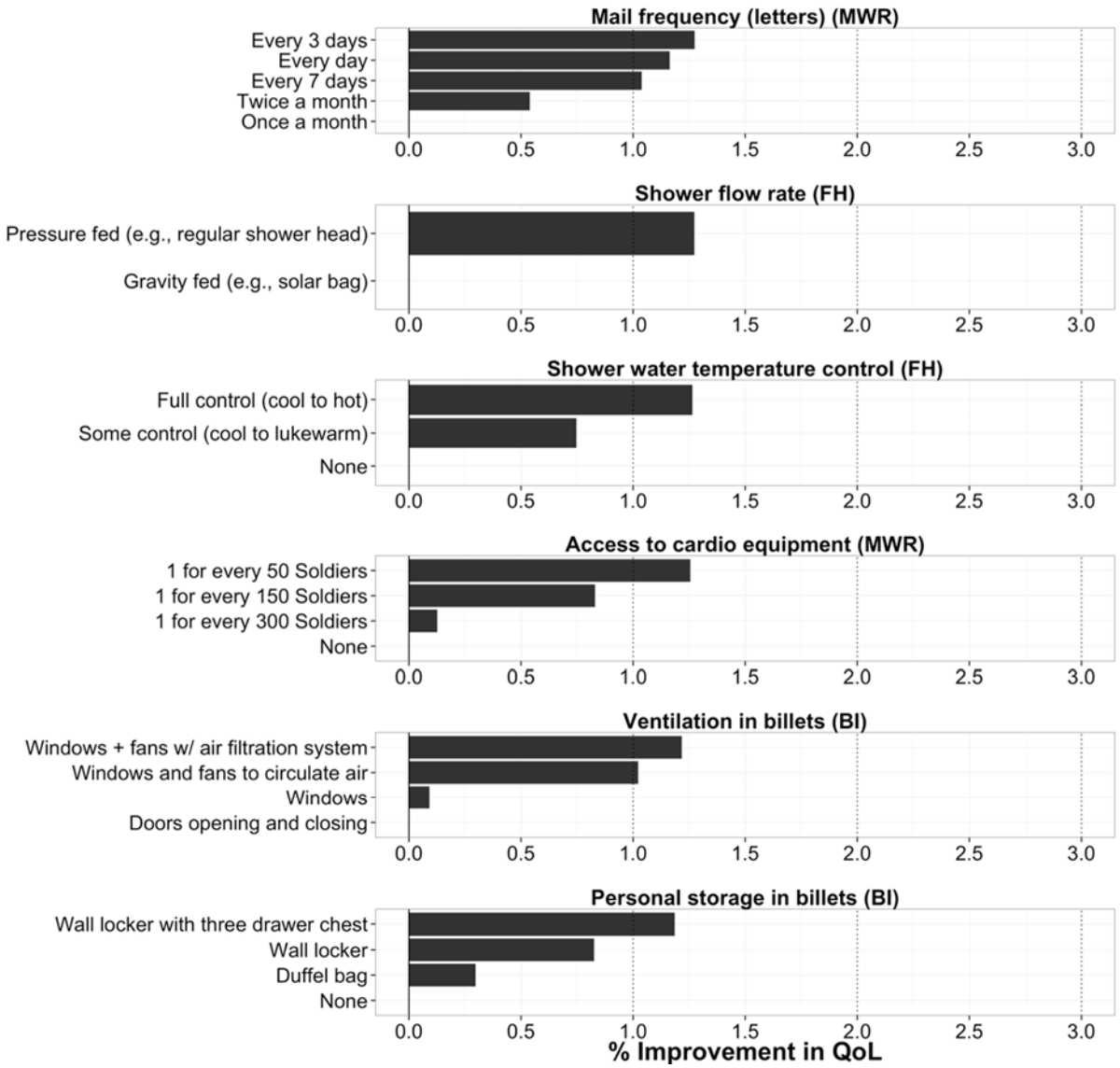
Note: Each subplot shows the improvement in QoL that can be achieved with each level of a single attribute. The name of the attribute and its family are shown above each subplot: FF = Field Feeding; FH = Field Hygiene; BI = Billets, MWR = Morale, Welfare, and Recreation; SPS = Spiritual & Psychological Support; WA = Work Area; PS = Personal Security.

Figure 18. Percent improvement in QoL for levels of six attributes: convenience power in MWR areas, noise level in billets, video chat (Skype, etc.), overhead lighting in work area, overhead lighting in billets, and dining area.



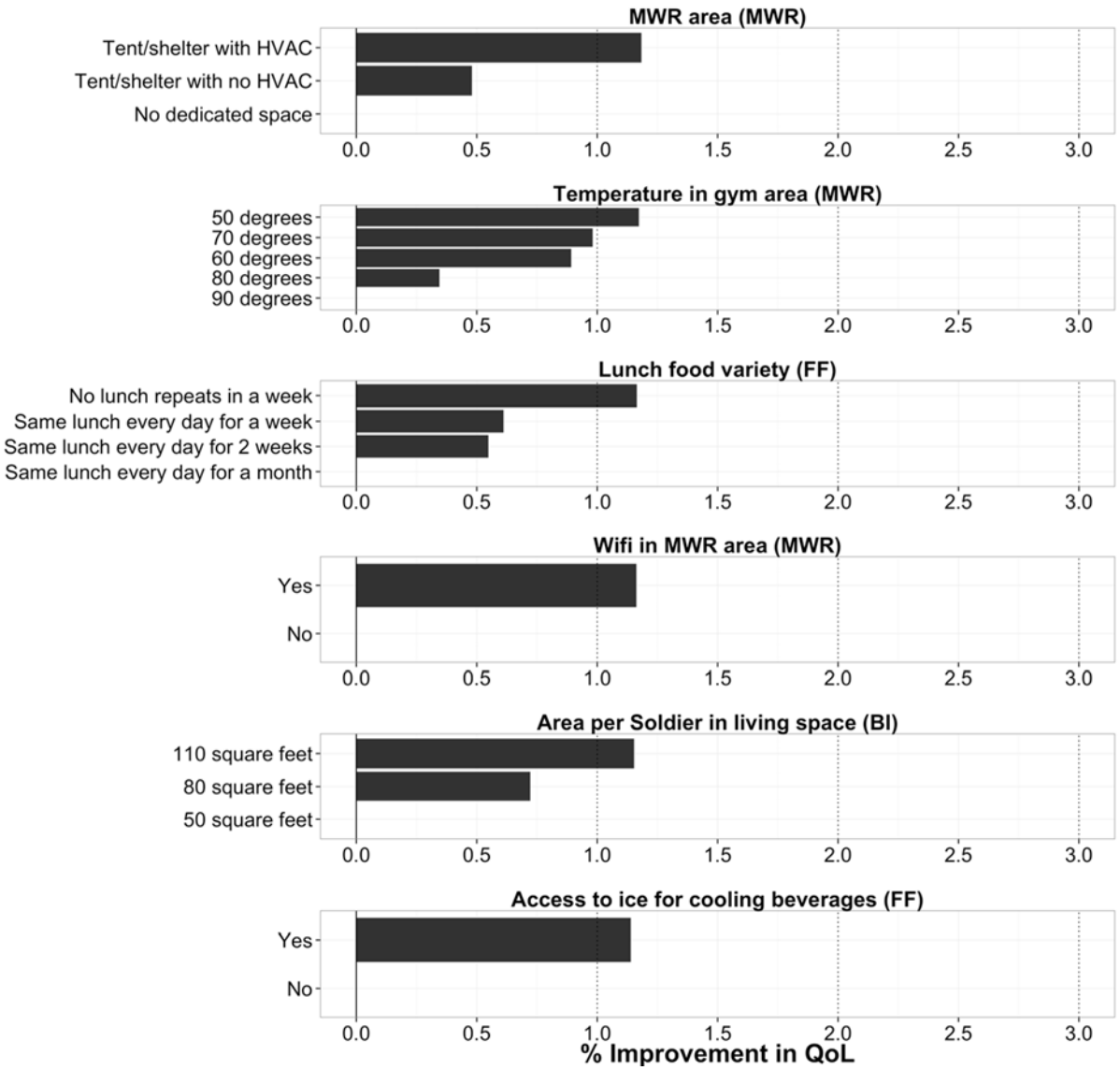
Note: Each subplot shows the improvement in QoL that can be achieved with each level of a single attribute. The name of the attribute and its family are shown above each subplot: FF = Field Feeding; FH = Field Hygiene; BI = Billets; MWR = Morale, Welfare, and Recreation; SPS = Spiritual & Psychological Support; WA = Work Area; PS = Personal Security.

Figure 19. Percent improvement in QoL for levels of six attributes: person doing laundry, PX/AAFES type, shower duration, humidity level in work area, flooring in billets, and lunch rations.



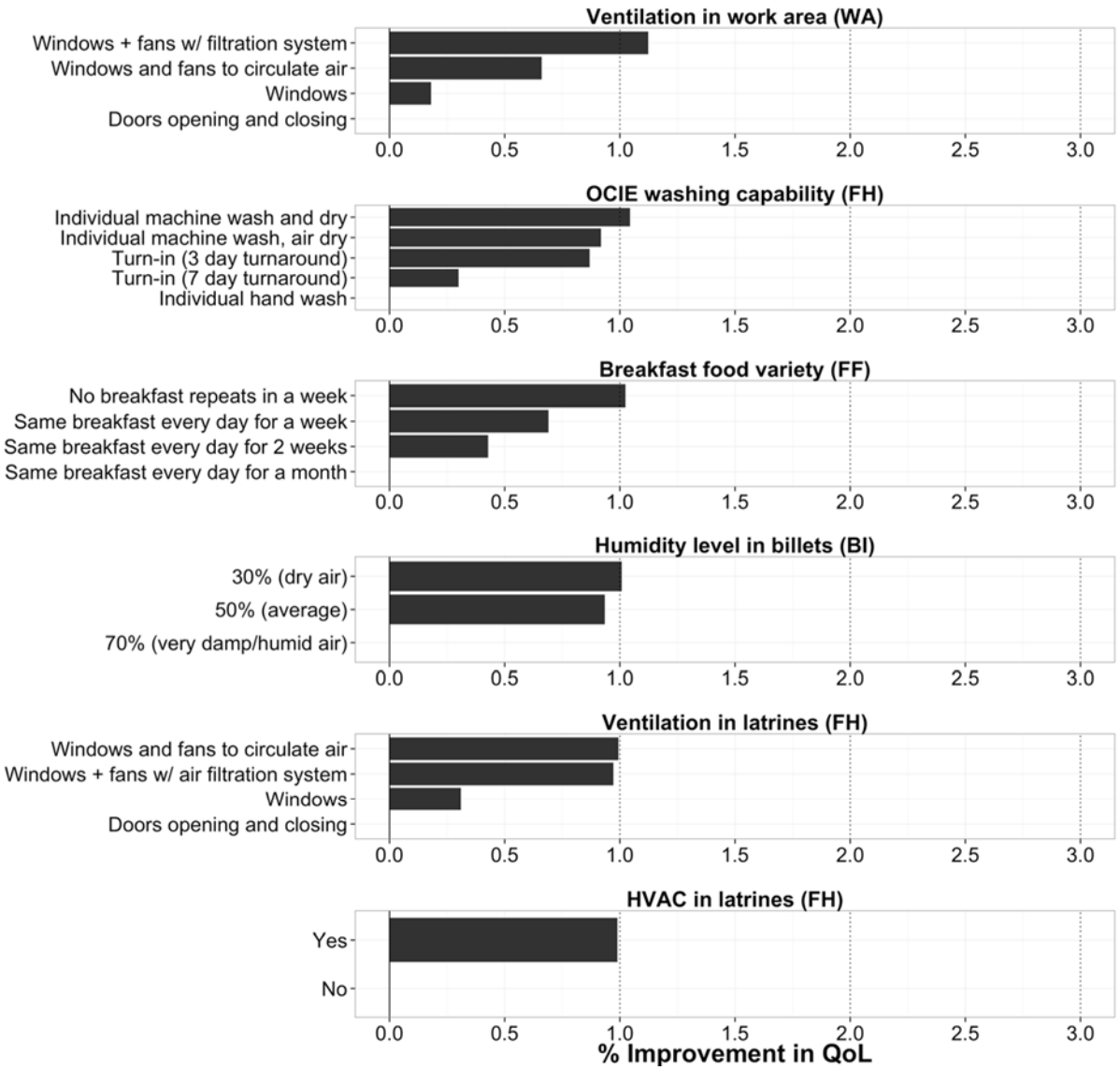
Note: Each subplot shows the improvement in QoL that can be achieved with each level of a single attribute. The name of the attribute and its family are shown above each subplot: FF = Field Feeding; FH = Field Hygiene; BI = Billets; MWR = Morale, Welfare, and Recreation; SPS = Spiritual & Psychological Support; WA = Work Area; PS = Personal Security.

Figure 20. Percent improvement in QoL for levels of six attributes: mail frequency (letters), shower flow rate, shower water temperature control, access to cardio equipment, ventilation in billets, and personal storage in billets.



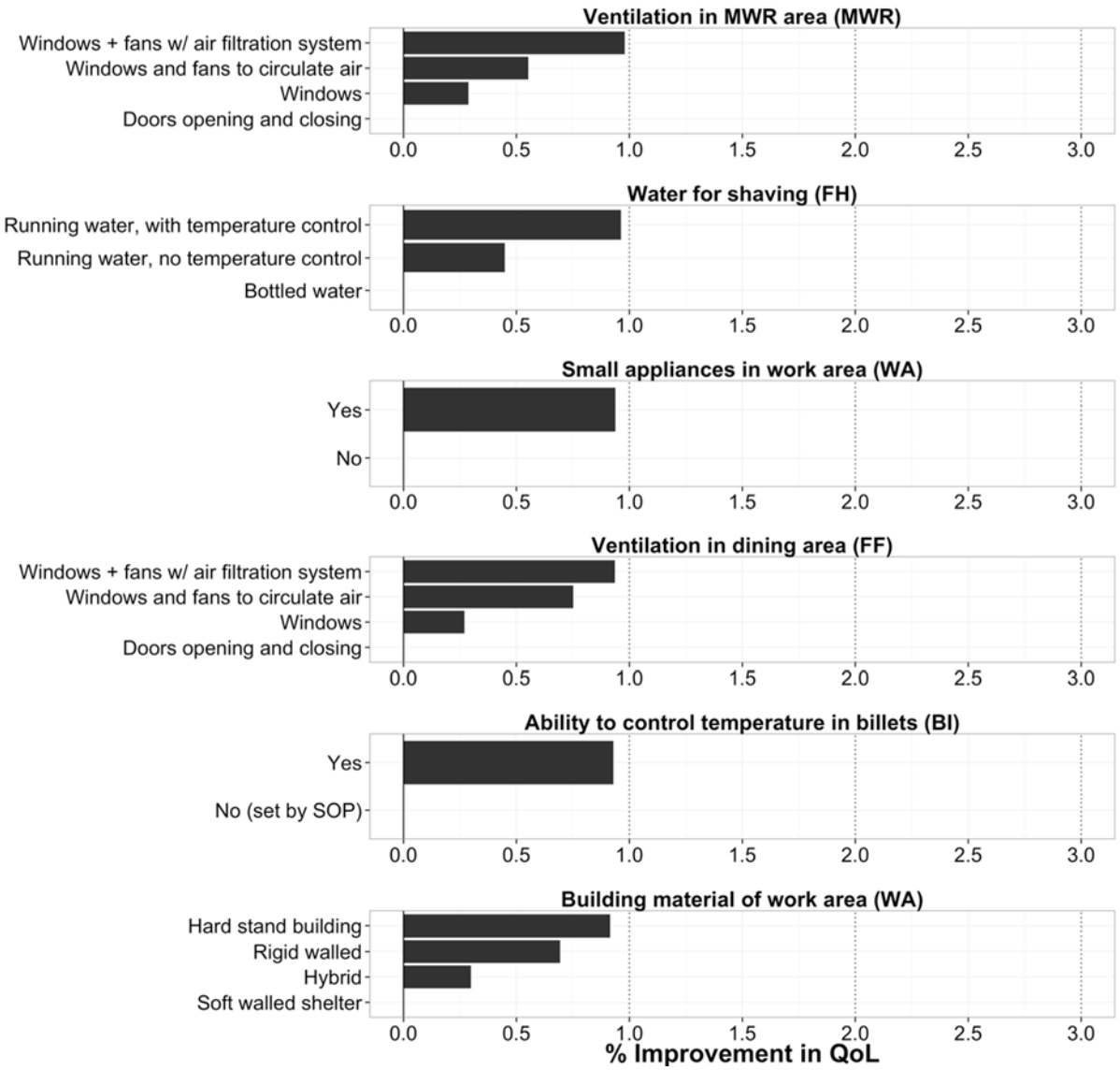
Note: Each subplot shows the improvement in QoL that can be achieved with each level of a single attribute. The name of the attribute and its family are shown above each subplot: FF = Field Feeding; FH = Field Hygiene; BI = Billets; MWR = Morale, Welfare, and Recreation; SPS = Spiritual & Psychological Support; WA = Work Area; PS = Personal Security.

Figure 21. Percent improvement in QoL for levels of six attributes: MWR area, temperature in gym area, lunch food variety, WiFi in MWR area, area per Soldier in living space, and access to ice for cooling beverages.



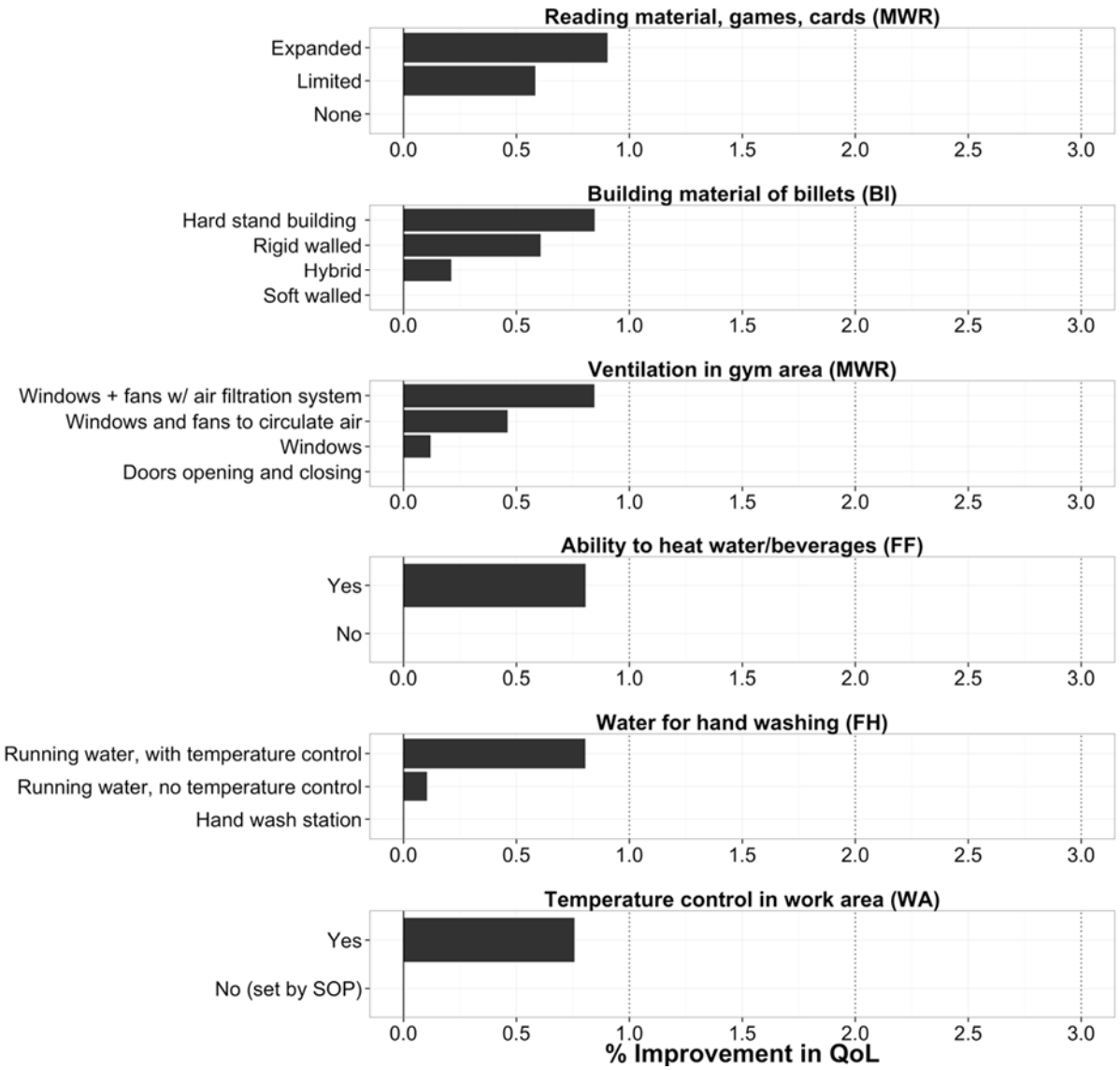
Note: Each subplot shows the improvement in QoL that can be achieved with each level of a single attribute (the name of the attribute and its family are shown above each subplot: FF = Field Feeding; FH = Field Hygiene; BI = Billets; MWR = Morale, Welfare, and Recreation; SPS = Spiritual & Psychological Support; WA = Work Area; PS = Personal Security.

Figure 22. Percent improvement in QoL for levels of six attributes: ventilation in work area, OCIE washing capability, breakfast food variety, humidity level in billets, ventilation in latrines, and HVAC in latrines.



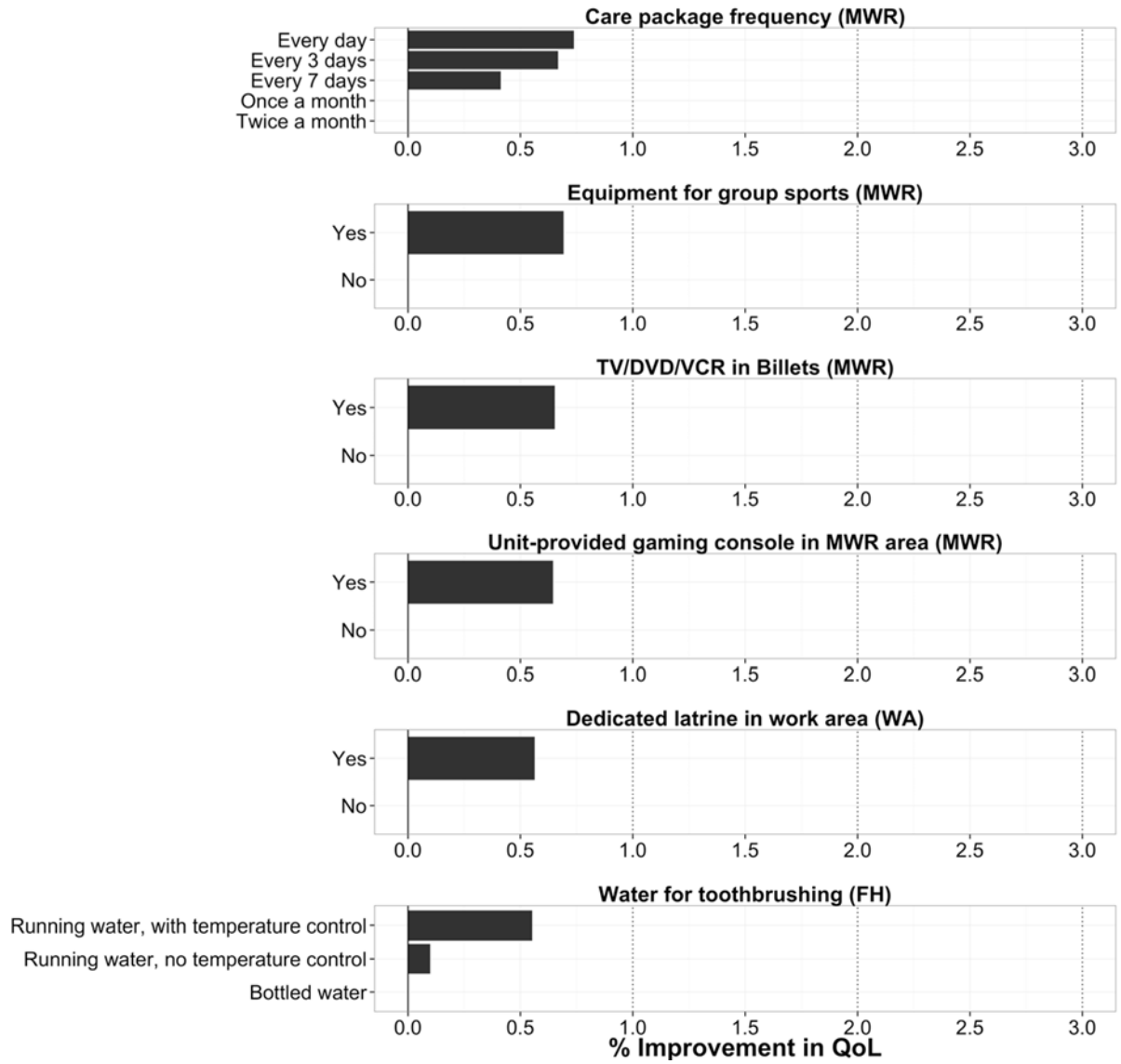
Note: Each subplot shows the improvement in QoL that can be achieved with each level of a single attribute. The name of the attribute and its family are shown above each subplot: FF = Field Feeding; FH = Field Hygiene; BI = Billets; MWR = Morale, Welfare, and Recreation; SPS = Spiritual & Psychological Support; WA = Work Area; PS = Personal Security.

Figure 23. Percent improvement in QoL for levels of six attributes: ventilation in MWR area, water for shaving, small appliances in work area, ventilation in dining area, ability to control temperature in billets, and building material of work area.



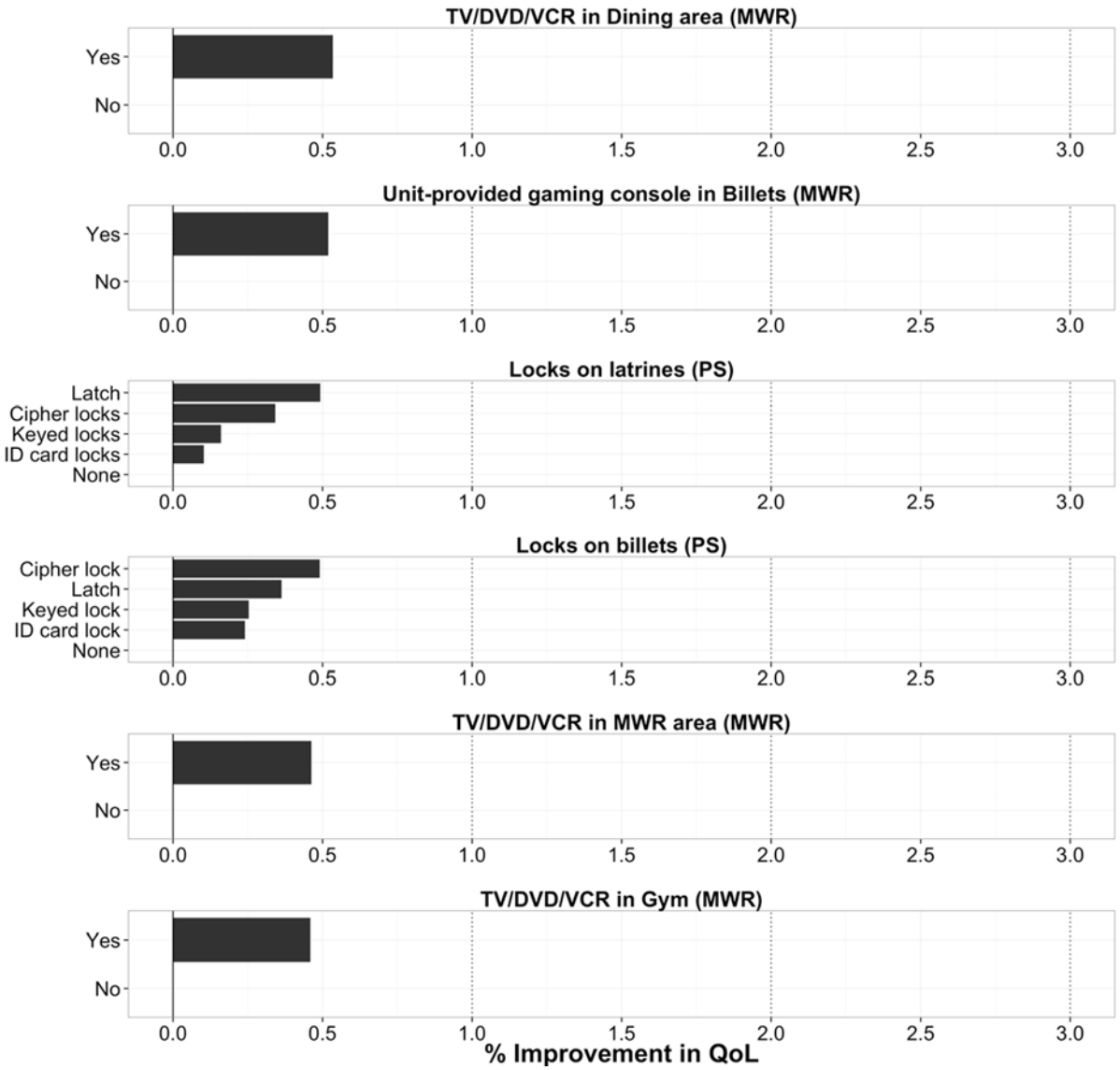
Note: Each subplot shows the improvement in QoL that can be achieved with each level of a single attribute. The name of the attribute and its family are shown above each subplot: FF = Field Feeding; FH = Field Hygiene; BI = Billets; MWR = Morale, Welfare, and Recreation; SPS = Spiritual & Psychological Support; WA = Work Area; PS = Personal Security.

Figure 24. Percent improvement in QoL for levels of six attributes: reading material, games, cards; building material of billets; ventilation in gym area; ability to heat water/beverages; water for hand washing; and temperature control in work area.



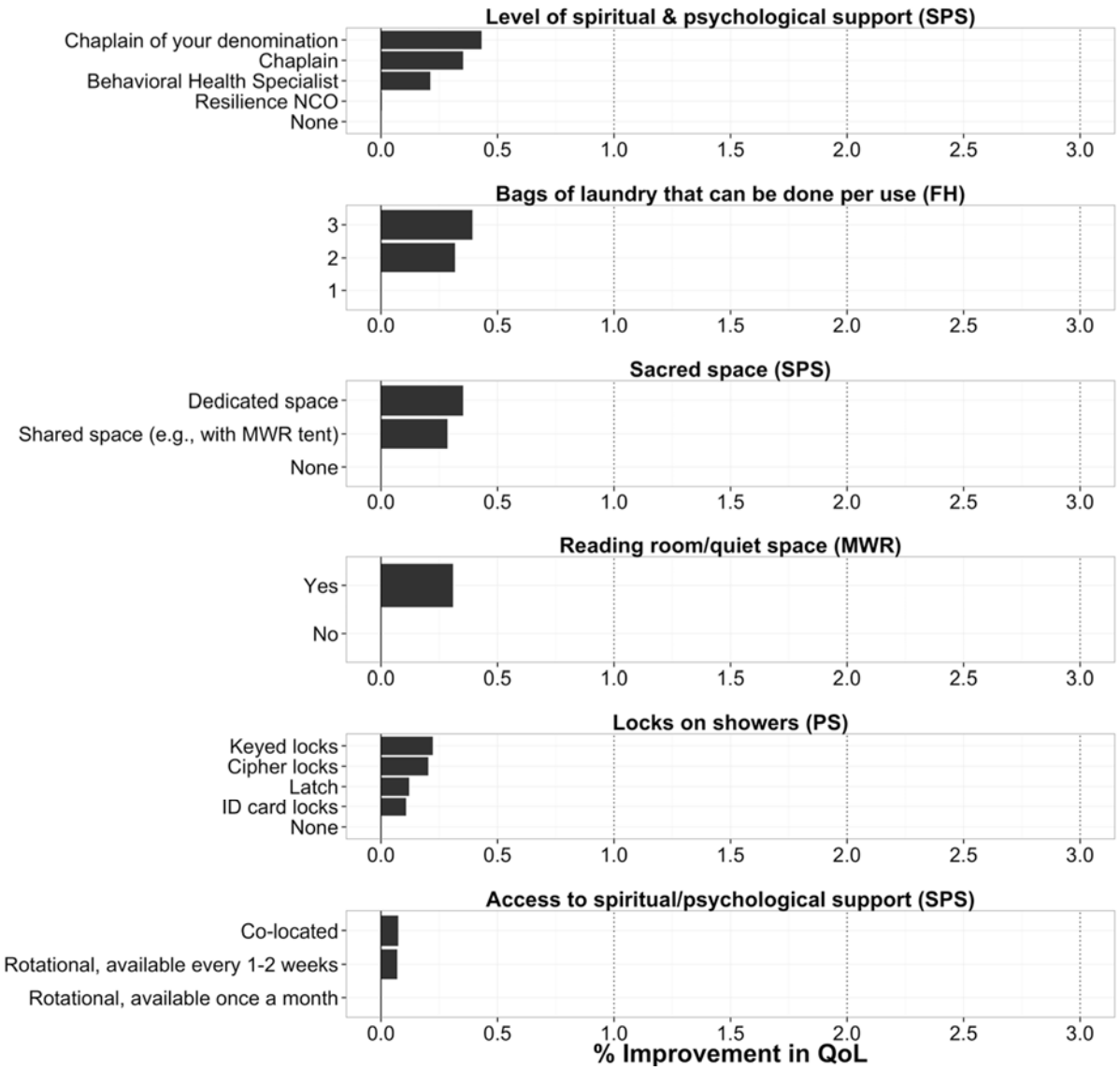
Note: Each subplot shows the improvement in QoL that can be achieved with each level of a single attribute. The name of the attribute and its family are shown above each subplot: FF = Field Feeding; FH = Field Hygiene; BI = Billets; MWR = Morale, Welfare, and Recreation; SPS = Spiritual & Psychological Support; WA = Work Area; PS = Personal Security).

Figure 25. Percent improvement in QoL for levels of six attributes: care package frequency, equipment for group sports, TV/DVD/VCR in billets, unit-provided gaming console in MWR area, dedicated latrine in work area, and water for toothbrushing.



Note: Each subplot shows the improvement in QoL that can be achieved with each level of a single attribute. The name of the attribute and its family are shown above each subplot: FF = Field Feeding; FH = Field Hygiene; BI = Billets; MWR = Morale, Welfare, and Recreation; SPS = Spiritual & Psychological Support; WA = Work Area; PS = Personal Security.

Figure 26. Percent improvement in QoL for levels of six attributes: TV/DVD/VCR in dining area, unit-provided gaming console in billets, locks on latrines, locks on billets, TV/DVD/VCR in MWR area, and TV/DVD/VCR in gym.



Note: Each subplot shows the improvement in QoL that can be achieved with each level of a single attribute. The name of the attribute and its family are shown above each subplot: FF = Field Feeding; FH = Field Hygiene; BI = Billets; MWR = Morale, Welfare, and Recreation; SPS = Spiritual & Psychological Support; WA = Work Area; PS = Personal Security.

Figure 27. Percent improvement in QoL for levels of six attributes: level of spiritual and psychological support, bags of laundry that can be done per use, sacred space, reading room/quiet space, locks on showers, and access to spiritual/psychological support.

4. Conclusions

The purpose of this study was to develop a model of how characteristics of austere contingency base camps affect Soldier QoL. This model was developed to support analysis activities under the SLB-STO-D. The SLB-STO-D seeks to identify technologies that can reduce the need for fuel resupply by 25%, reduce the need for water resupply by 75%, and decrease waste generation/backhaul by 50% while maintaining Force Provider-like QoL for the resident forces. The motivation behind this work was to develop a quantitative method for estimating QoL that enables detailed tradeoffs of QoL with fuel, water, and waste.

Overall the results of the study were positive. Data were collected from over 1,200 Soldiers with recent experience operating out of bases housing fewer than 1,000 personnel. The survey respondents represented a wide range of Army MOS, rank, gender, and other demographic characteristics, enabling the model to be representative of the populations who live and work on austere base camps. The resulting data were highly complex – 84 attributes is an ambitious number for discrete choice studies to tackle. However, the results were quite consistent and appeared statistically sound.

Reviewing the major findings:

- Soldiers prioritized many attributes related to creating conditions conducive to quality sleep. This includes bed type (the overall most important attribute), HVAC in billets, privacy, and so on. This suggests that a primary goal for base camp design should be to ensure the camp provides, at minimum, optimal sleep conditions.
- Overall, dinner was the most important meal of the day in terms of Soldier preferences for having freshly cooked, non-ration meals. Breakfast was the second most important meal of the day, followed by lunch. This suggests that the Army could significantly improve QoL by focusing on designing new rations and meal preparation capabilities for dinner service.
- Soldiers cared more about the number of people in their living space, privacy, and noise than they did about how much space each individual could have. These results suggest that Soldiers can get by with a minimum of space, but that they need some capability to have privacy, and that they prefer to share space with the smallest number of people possible.
- Showers were also critical for QoL. Soldiers would generally prefer more frequent showers in a facility that offers some privacy. They are less concerned about shower duration – a short shower appears to be acceptable as long as it can take place at least once per day.

The present data also highlight numerous small interventions that have minimal resource demands, but could combine to significantly improve QoL at contingency base camps. Many of the Soldiers the team spoke with during the course of this study indicated that life at a base camp is often a case of "death by 1000 cuts". It is rare that Soldier QoL plummets when only one or two aspects of a camp are deficient. Soldiers are, on the whole, a resilient population accustomed to less than ideal conditions. This is especially true of the kind of Soldier likely to be found on a battalion or smaller-sized camp. Instead, Soldiers described being worn down over time by many small inconveniences and discomforts. This data suggests that camps might be significantly

improved by looking for packages of small, low-resource changes that can combine to alleviate many of the pain points that wear on Soldiers during a deployment.

In addition to the analysis presented in this report, NSRDEC has built an interactive data tool in Microsoft Excel using the individual-level part-worth data. This tool allows system developers, requirements developers, and other stakeholders to explore tradeoffs in base camp design in order to understand how changes in camp capabilities could impact Soldier QoL. This tool is available upon request, but is best used with oversight and instruction from the SLB-STO-D team.

While the study met its objectives overall, there are some limitations to the present work. First, the attributes developed for this study were based on the needs and technology focus of the STO-D. Therefore, there are likely to be some aspects of smaller camps that are not adequately captured in the present attribute set. In addition, the present QoL model applies strictly to camps housing fewer than 1,000 personnel. Larger FOBs have significantly more capabilities (e.g., food courts with contractor-prepared, name brand fast foods). Care should be taken in trying to extend the present model to larger, less austere camps. Furthermore, it would have been impossible to include in the attribute set every possible condition that one might encounter on a base camp. For example, during survey administration some Soldiers commented that they had highly idiosyncratic billeting conditions that the billeting attributes only partially captured. The nature of war is improvisation and adaptation, so a fixed survey will inevitably miss some unique conditions. However, the team is confident that the present attribute set represents a “95%” solution covering the most common conditions encountered on contingency base camps.

Finally, while this work was focused on quantifying QoL, there remains the larger issue of how QoL interacts with other behavioral and environmental conditions to drive Soldier mission readiness. At the end of the day, the primary concern of commanders at all levels within the Army is to ensure that the service can field a reliable supply of Soldiers who are willing and able to perform their assigned mission. QoL is one potentially important driver of readiness. For example, Soldiers who have poor QoL related to billeting conditions might not be able to get adequate rest. This could ultimately have consequences during missions, such as a lack of vigilance or slower decision-making. The link between QoL and readiness is potentially even more complex than the challenge of quantifying QoL. However, understanding this link forms the basis for understanding the true value of sustaining QoL. Therefore, NSRDEC has begun follow-on research that aims to begin examining how base camp QoL influences readiness, both as a function of camp parameters and time.

This document reports research undertaken at the U.S. Army Natick Soldier Research, Development and Engineering Center, Natick, MA, and has been assigned No. NATICK/TR-16/022 in a series of reports approved for publication.

5. References

Augustyn, J., Benasutti, P., Bolduc, S., Darkow, D., Federici, J., Haddad, R., Howe, J., McCarty, P., & Mahoney, J. (2012). Technology-Enabled Capability Demonstration 4A Sustainability and Logistics-Basing Baseline Wargame. Internal Report. Natick, MA: U.S. Army Natick Soldier Research, Development, and Engineering Center.

Louviere, J. J., Flynn, T. N., & Carson, R. T. (2010). Discrete choice experiments are not conjoint analysis. *Journal of Choice Modelling*, *3*(3), 57-72.

Orme, B. (2000). Hierarchical Bayes: Why all the attention. Sawtooth Software Research Paper Series. Retrieved from https://sawtoothsoftware.com/download/techpap/hbwhy.pdf.

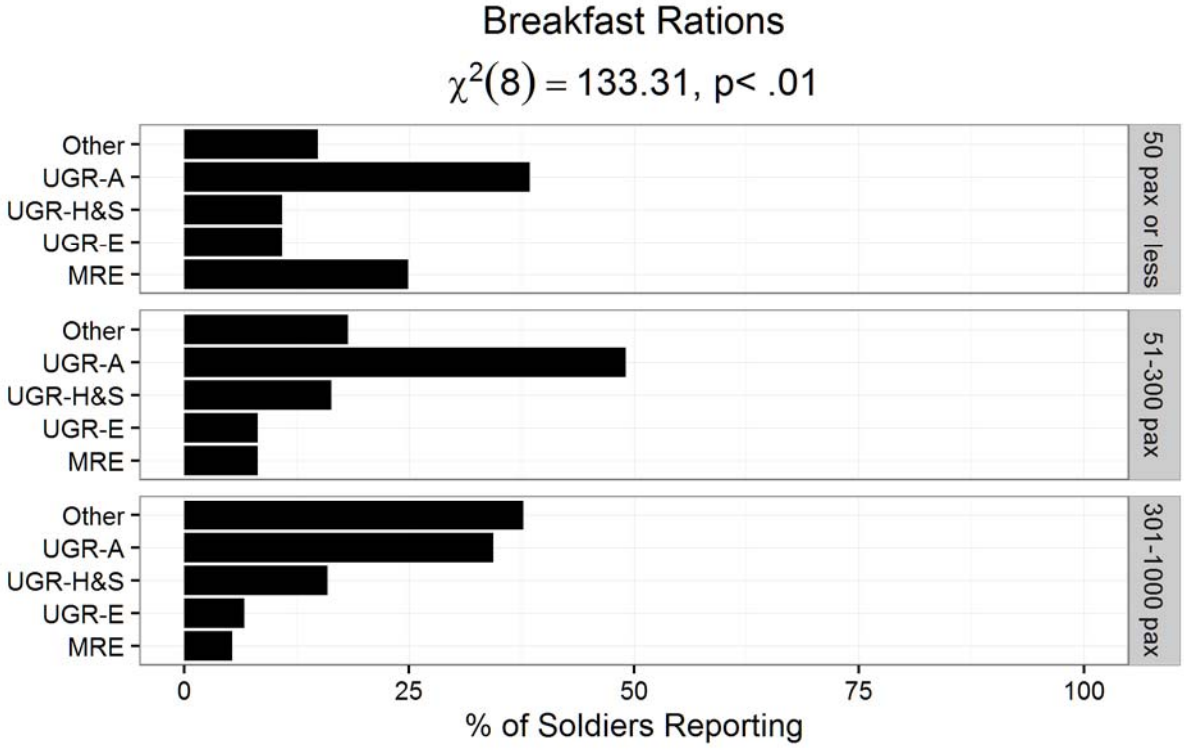
Rossi, P. E., Allenby, G. M., & McCulloch, R. (2006). Bayesm MCMC Functions & Key Bayesm Utilities. *Bayesian Statistics and Marketing*, 357-360.

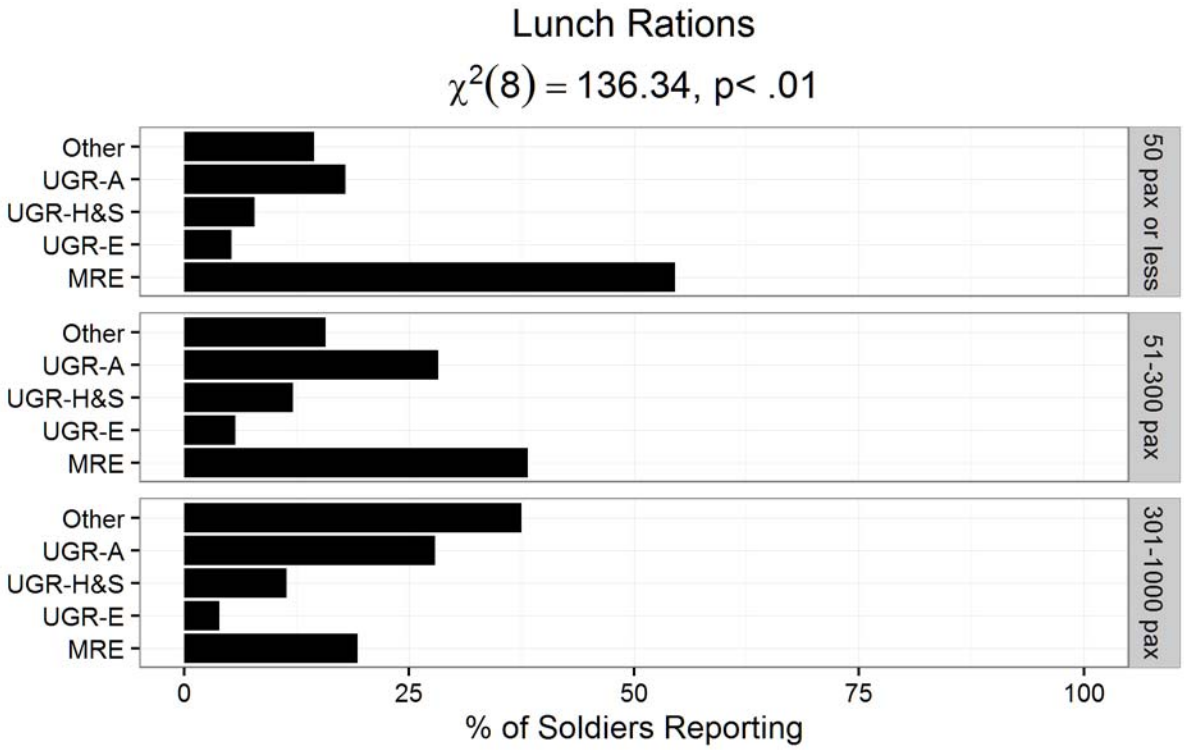
U.S. Army Training and Doctrine Command (April 2013). Army Techniques Publication 3-37.10 (Base Camps).

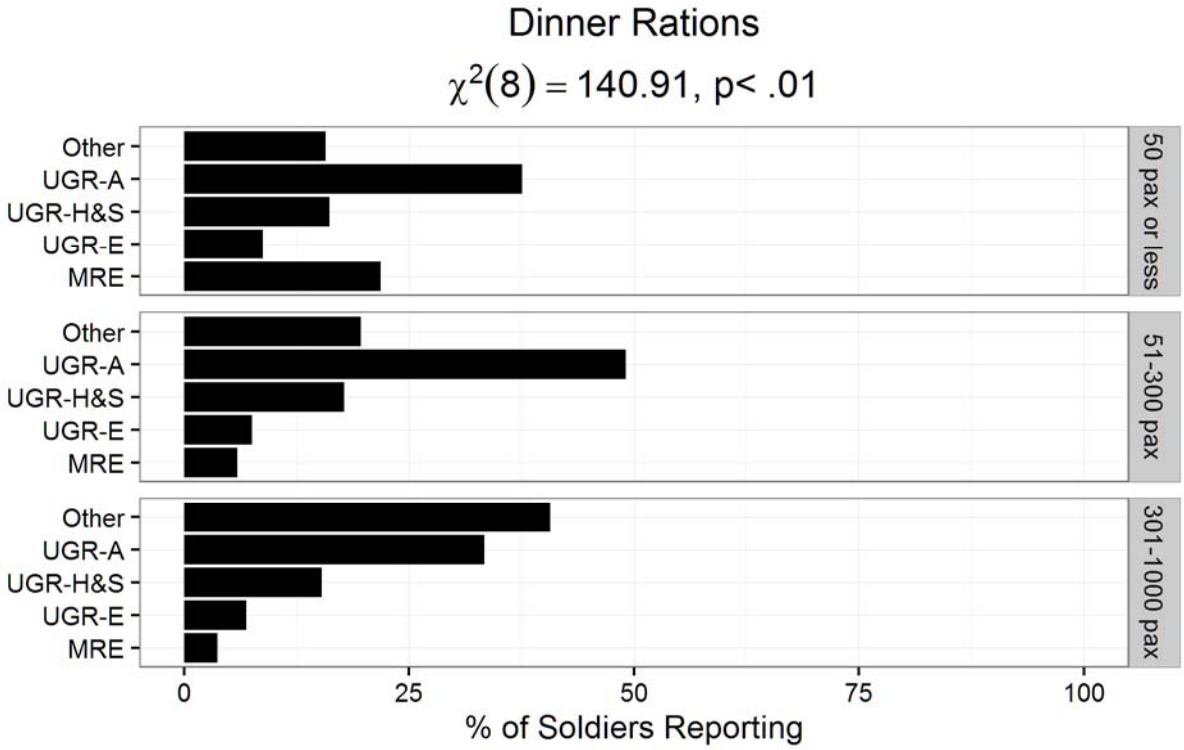
U.S. Army Research Development Engineering Command (May, 2014). Operationally Relevant Technical Baseline, TECD-4a/CLT/ORTB/300-PAX/FY12/1.0

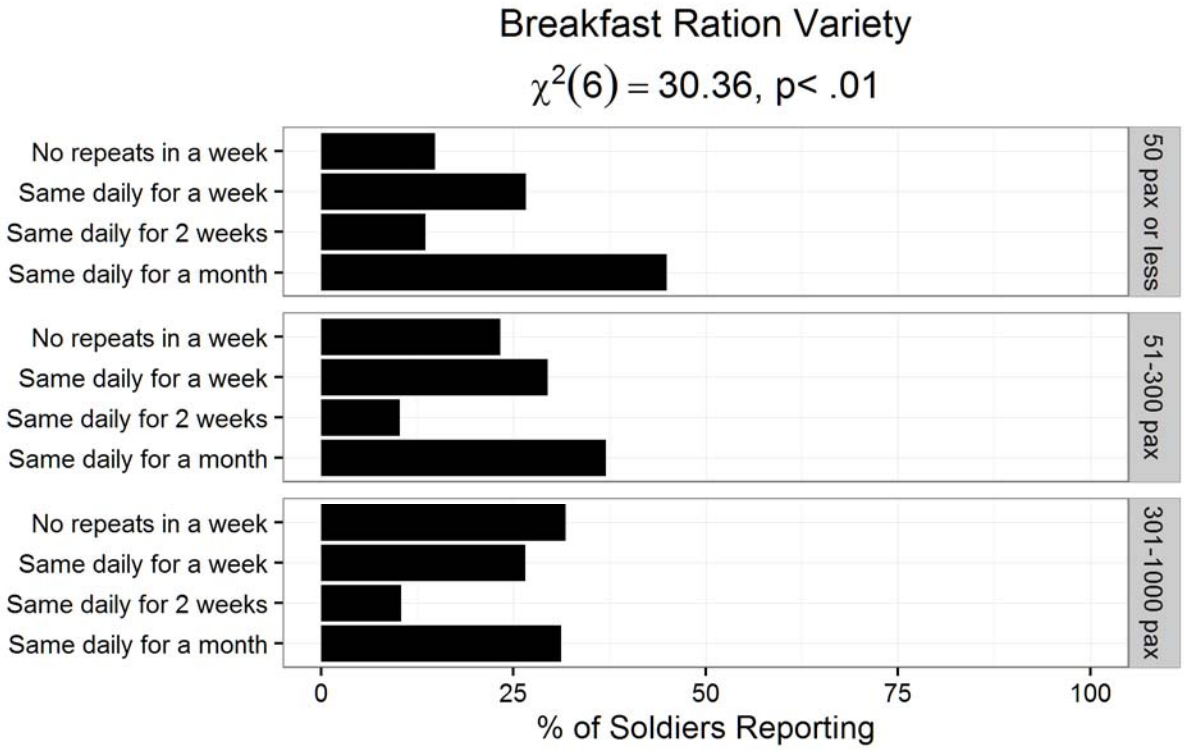
Appendix A: Base Camp Experience

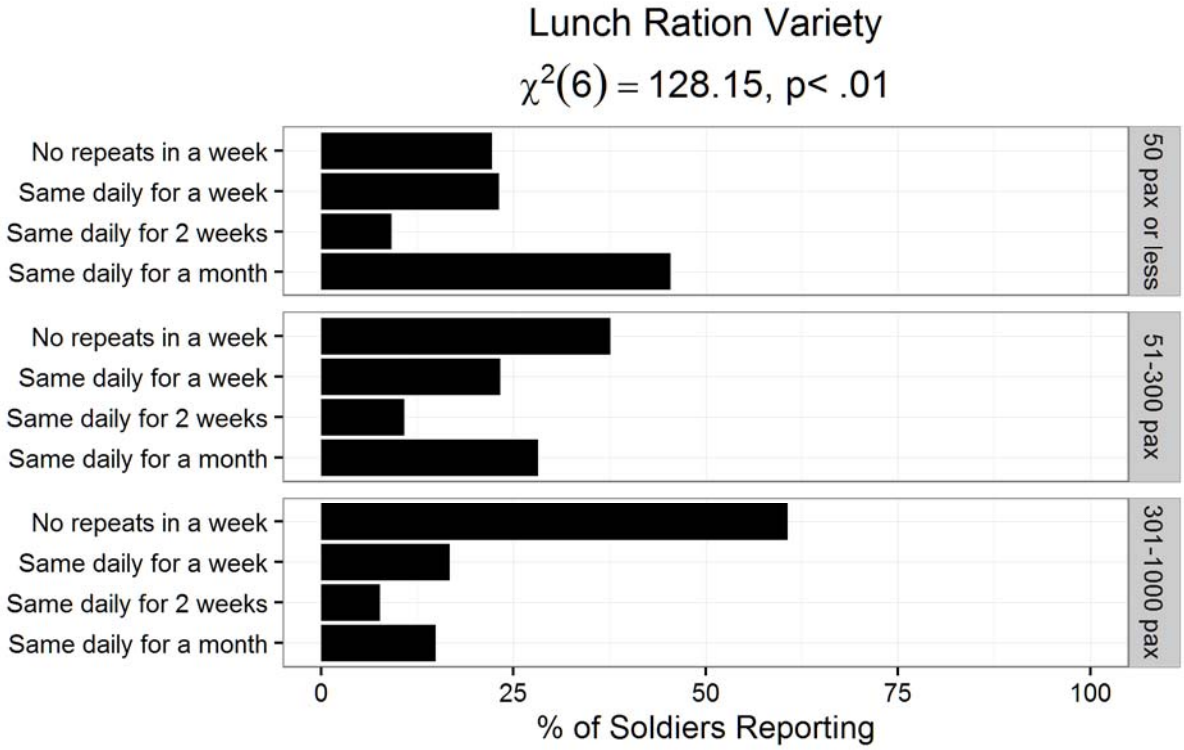
This appendix includes data on camp experiences as reported by Soldiers completing the QoL survey. For each attribute histograms are provided giving the distribution of attribute levels across each of the three camp sizes: fewer than 50 personnel (50 pax or less), 51-300 personnel (51-300 pax), and 301-1,000 personnel (301-1000 pax). In addition, a chi-square analysis was run for each attribute to determine if there were differences among the three camp sizes. The result of the chi-square (χ^2) for each attribute is provided below the title of each histogram.

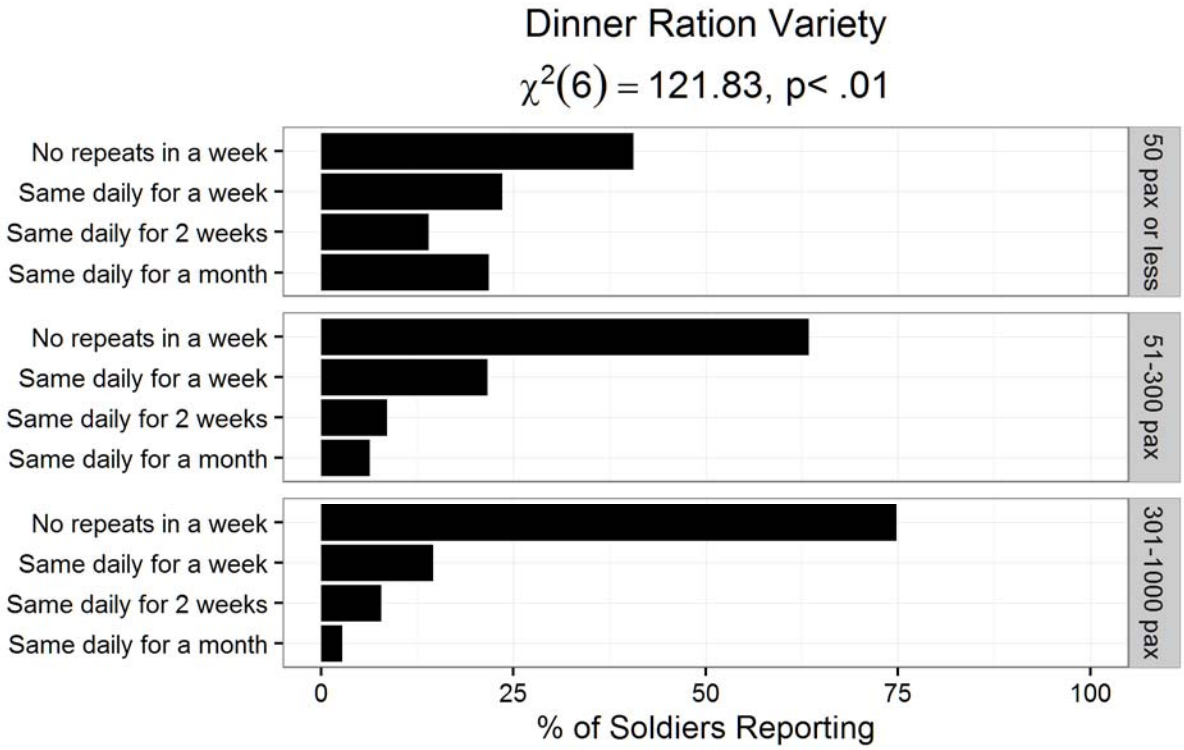


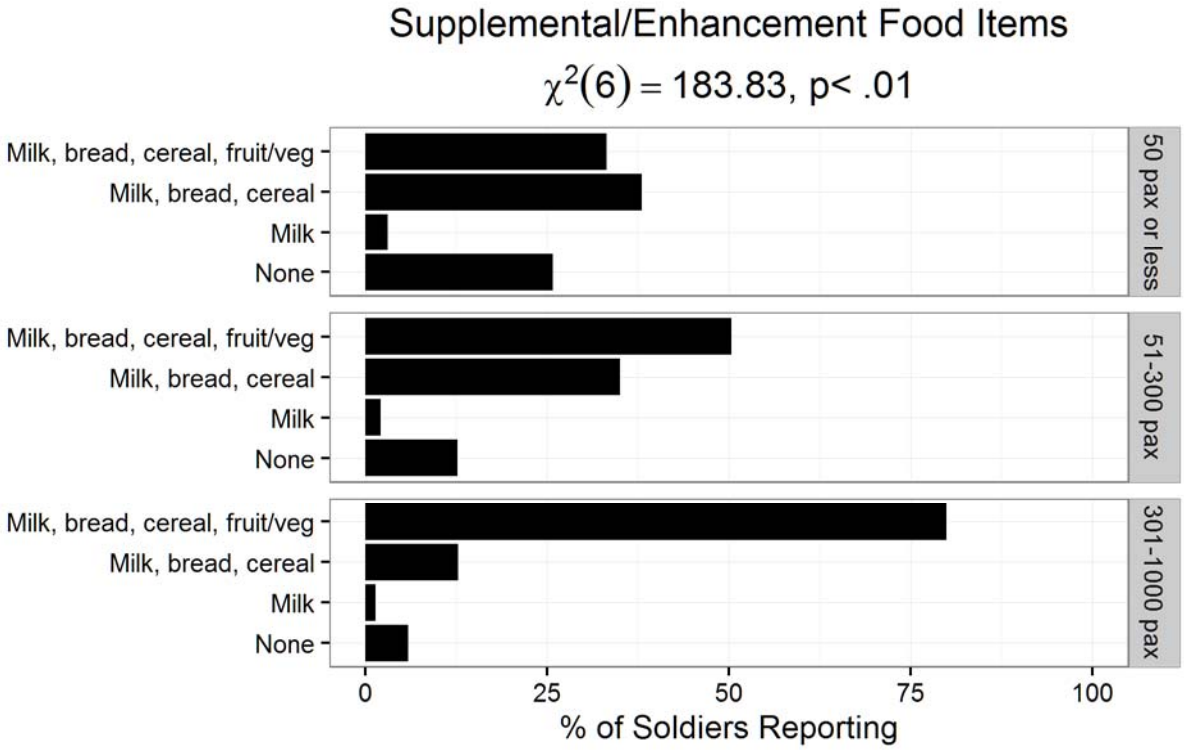

Lunch Rations
$\chi^2(8) = 136.34, p < .01$
Other
UGR-A
UGR-H&S
UGR-E
MRE
50 pax or less
51-300 pax
301-1000 pax
0
25
50
75
100
% of Soldiers Reporting

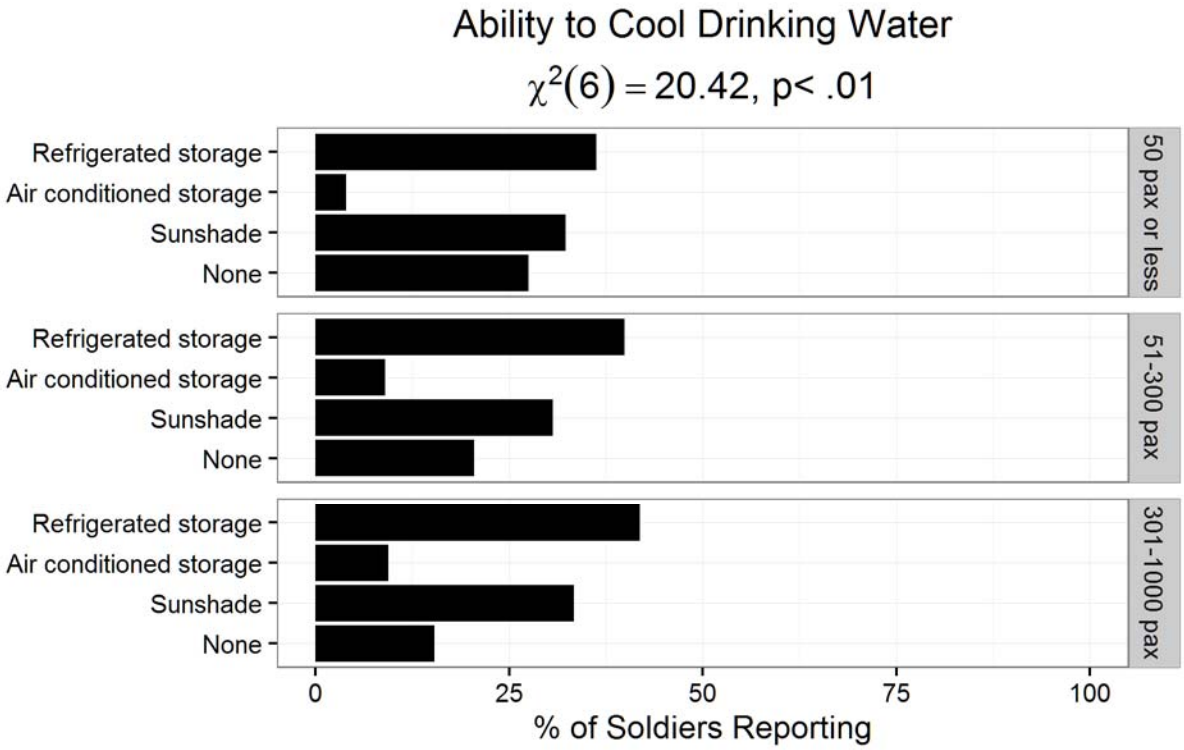

Dinner Rations
$\chi^2(8) = 140.91, p < .01$
Other
UGR-A
UGR-H&S
UGR-E
MRE
50 pax or less
51-300 pax
301-1000 pax
0
25
50
75
100
% of Soldiers Reporting

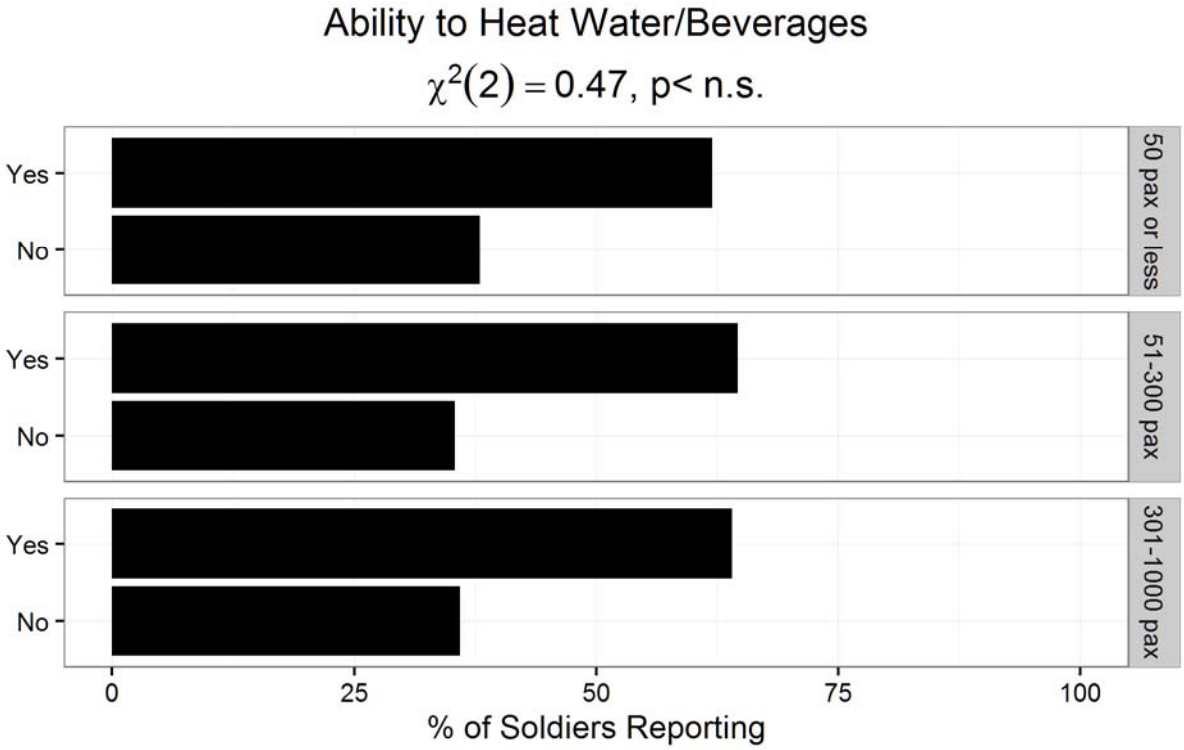

Breakfast Ration Variety
$\chi^2(6) = 30.36, p < .01$
No repeats in a week
Same daily for a week
Same daily for 2 weeks
Same daily for a month
50 pax or less
51-300 pax
301-1000 pax
0
25
50
75
100
% of Soldiers Reporting

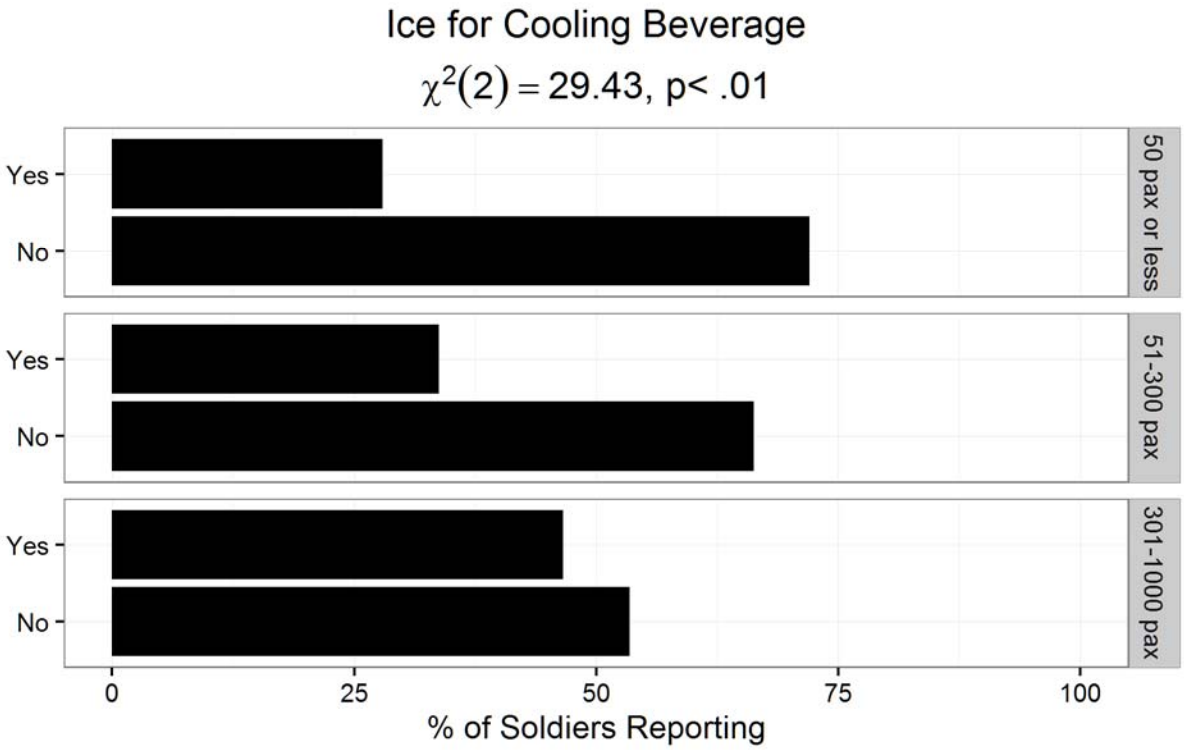

Lunch Ration Variety
$\chi^2(6) = 128.15, p < .01$
No repeats in a week
Same daily for a week
Same daily for 2 weeks
Same daily for a month
50 pax or less
51-300 pax
301-1000 pax
0
25
50
75
100
% of Soldiers Reporting

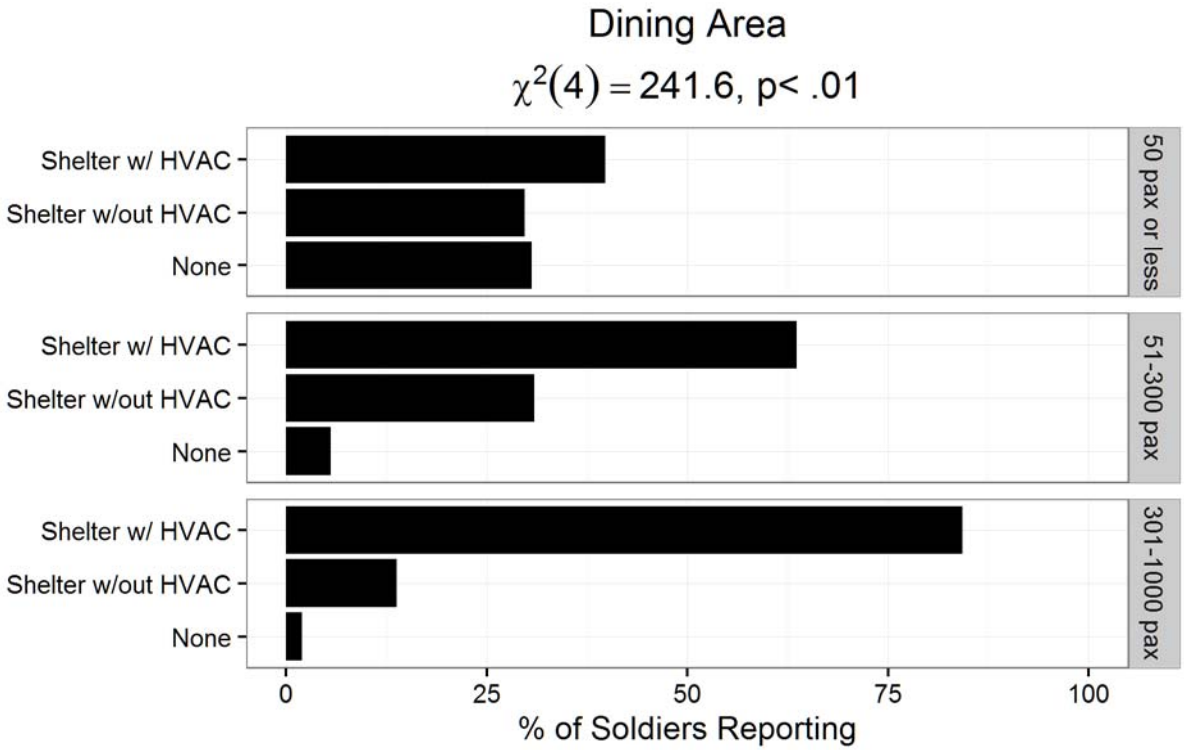

Dinner Ration Variety
$\chi^2(6) = 121.83, p < .01$
No repeats in a week
Same daily for a week
Same daily for 2 weeks
Same daily for a month
50 pax or less
51-300 pax
301-1000 pax
0
25
50
75
100
% of Soldiers Reporting

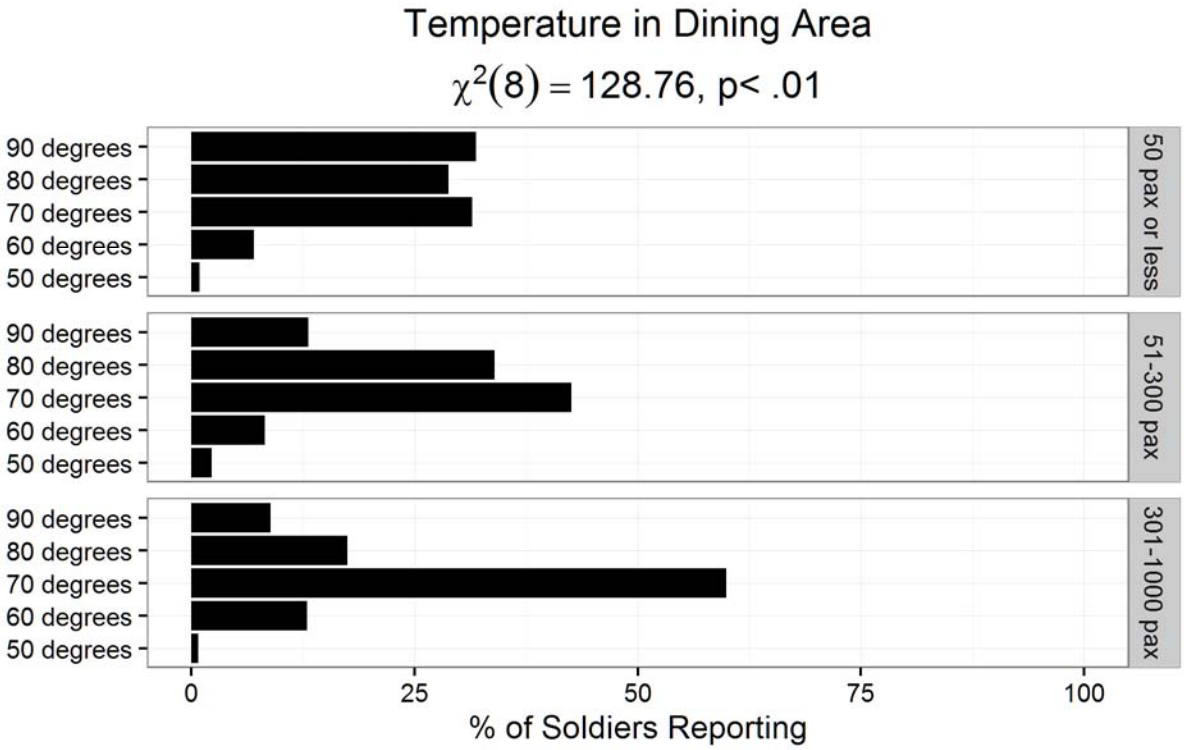

Supplemental/Enhancement Food Items
$\chi^2(6) = 183.83, p < .01$
Milk, bread, cereal, fruit/veg
Milk, bread, cereal
Milk
None
50 pax or less
51-300 pax
301-1000 pax
0
25
50
75
100
% of Soldiers Reporting

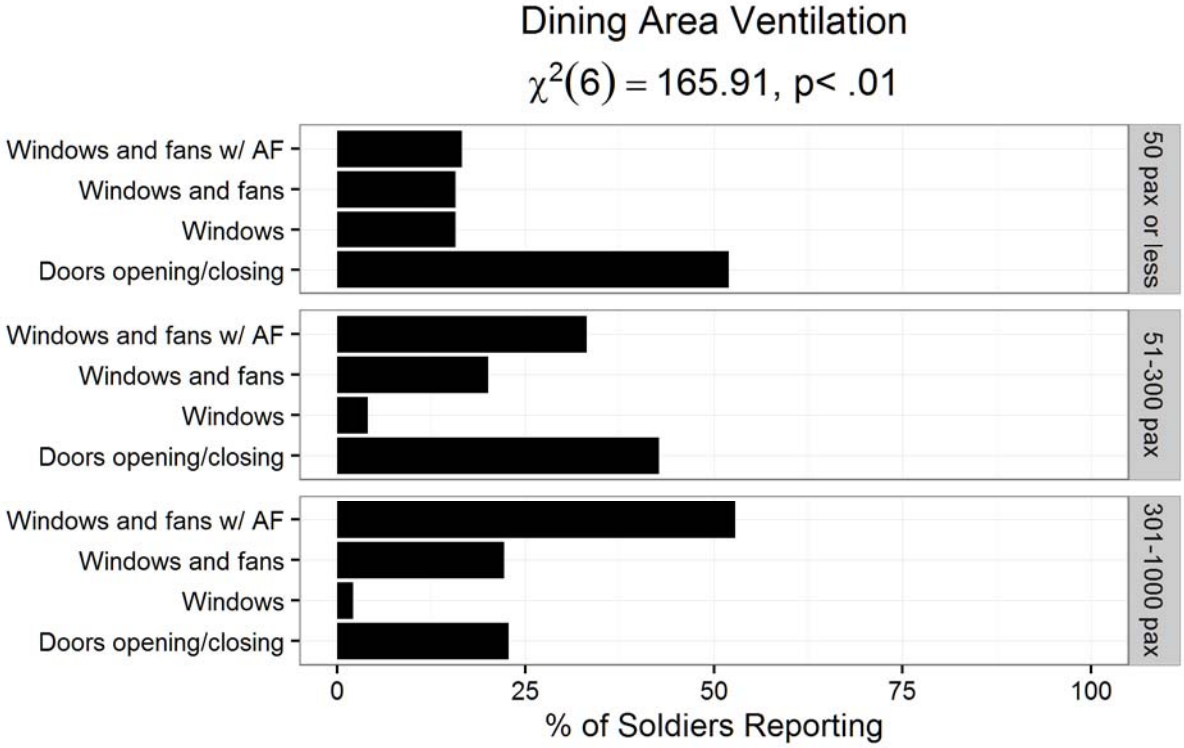

Ability to Cool Drinking Water
$\chi^2(6) = 20.42$, p< .01
Refrigerated storage
Air conditioned storage
Sunshade
None
50 pax or less
51-300 pax
301-1000 pax
0
25
50
75
100
% of Soldiers Reporting

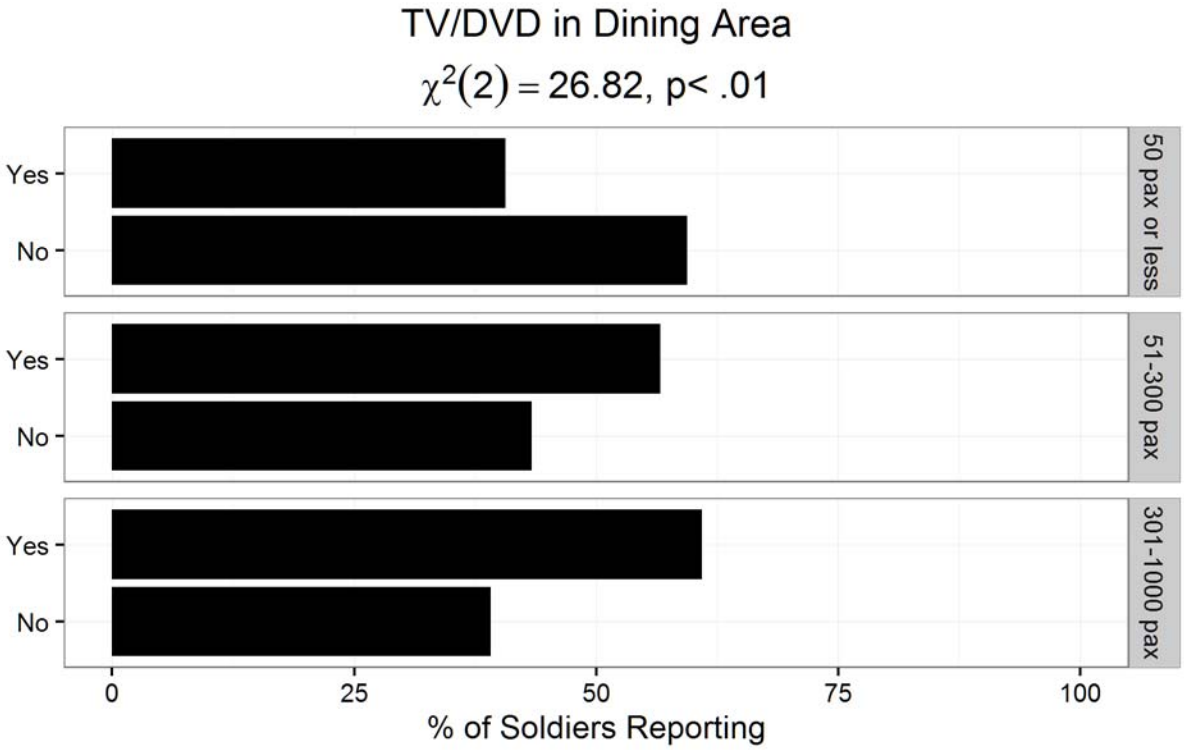

Ability to Heat Water/Beverages
$\chi^2(2) = 0.47$, p< n.s.
Yes
No
50 pax or less
51-300 pax
301-1000 pax
0
25
50
75
100
% of Soldiers Reporting

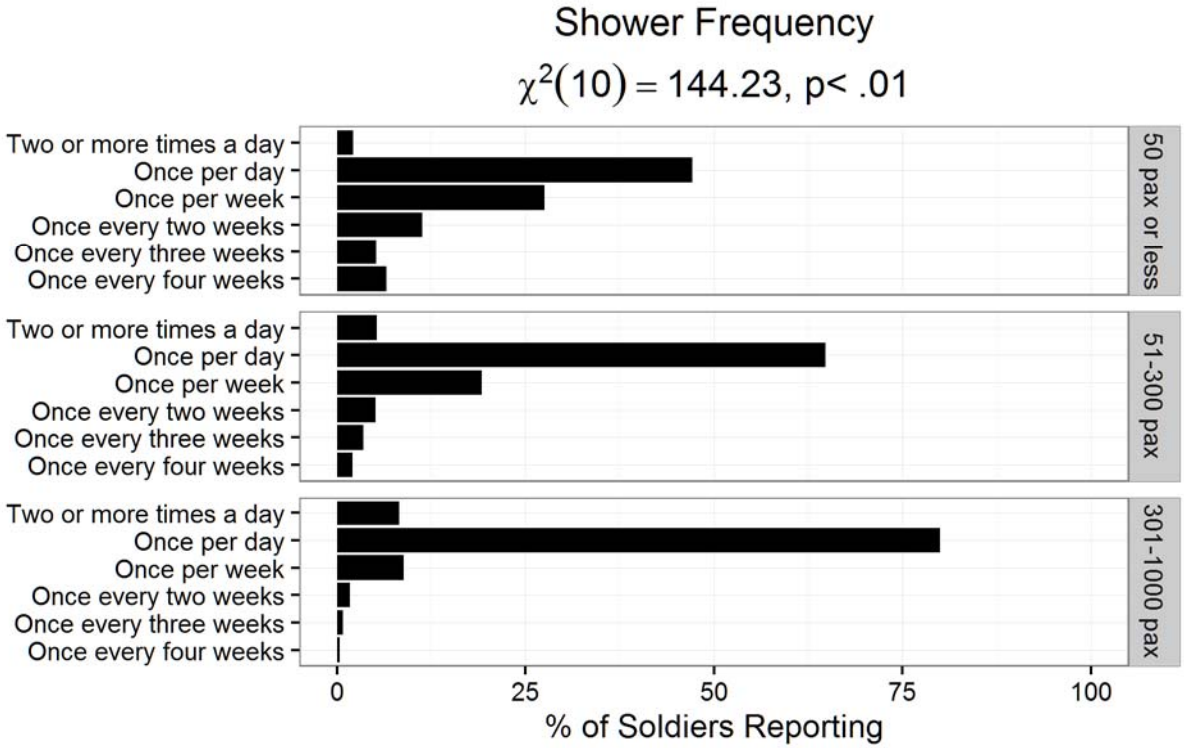

Ice for Cooling Beverage
$\chi^2(2) = 29.43, p < .01$
Yes
No
50 pax or less
Yes
No
51-300 pax
Yes
No
301-1000 pax
0
25
50
75
100
% of Soldiers Reporting

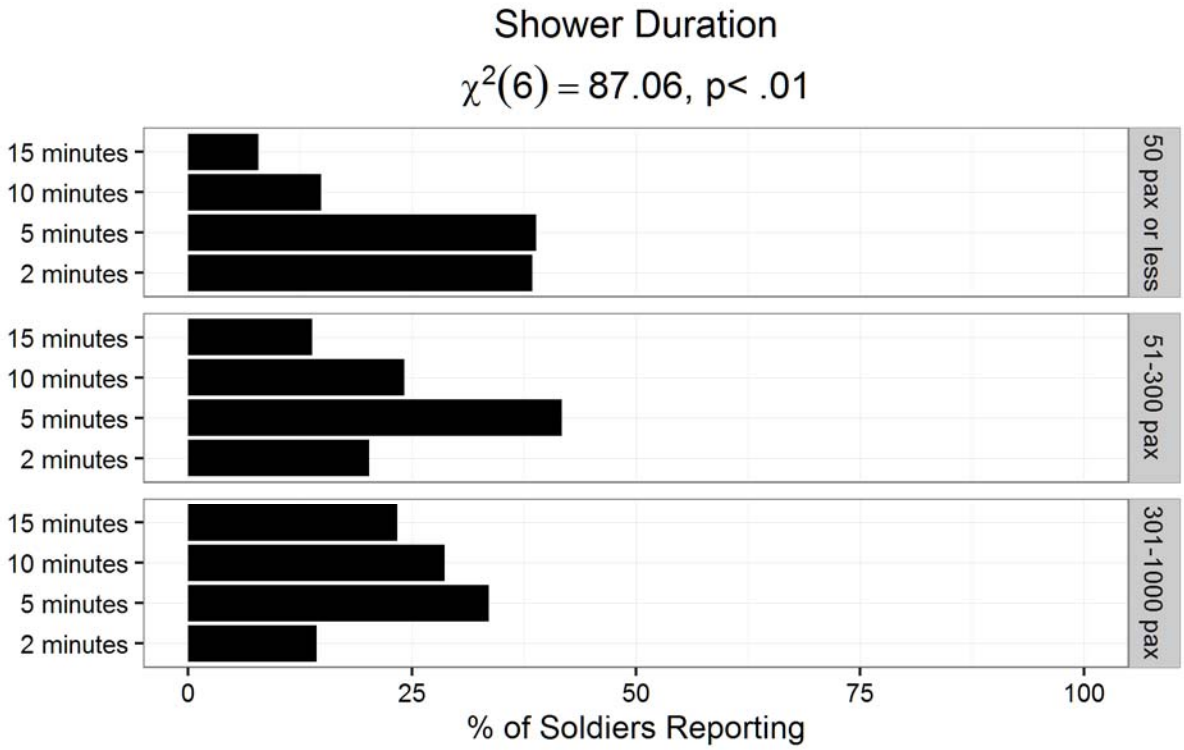

Dining Area
$\chi^2(4) = 241.6, p < .01$
Shelter w/ HVAC
Shelter w/out HVAC
None
50 pax or less
Shelter w/ HVAC
Shelter w/out HVAC
None
51-300 pax
Shelter w/ HVAC
Shelter w/out HVAC
None
301-1000 pax
0
25
50
75
100
% of Soldiers Reporting

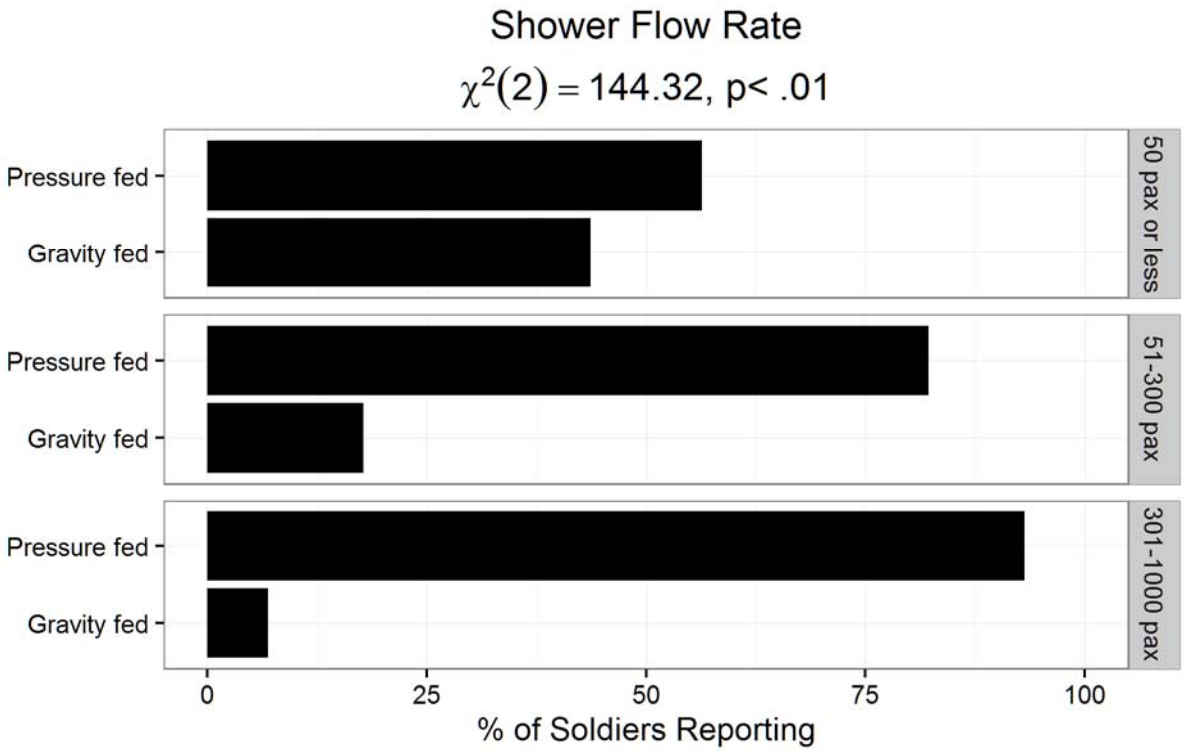

Temperature in Dining Area
$\chi^2(8) = 128.76, p < .01$
90 degrees
80 degrees
70 degrees
60 degrees
50 degrees
50 pax or less
51-300 pax
301-1000 pax
0
25
50
75
100
% of Soldiers Reporting

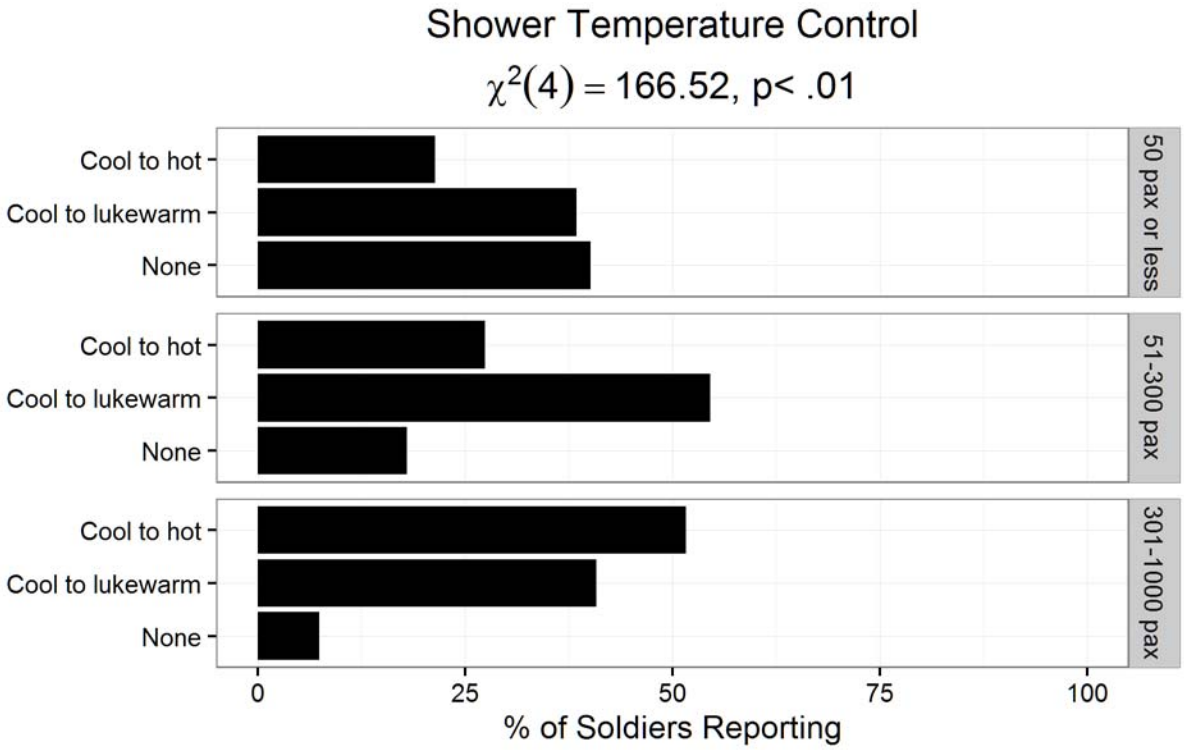

Dining Area Ventilation
$\chi^2(6) = 165.91, p < .01$
Windows and fans w/ AF
Windows and fans
Windows
Doors opening/closing
50 pax or less
51-300 pax
301-1000 pax
0
25
50
75
100
% of Soldiers Reporting

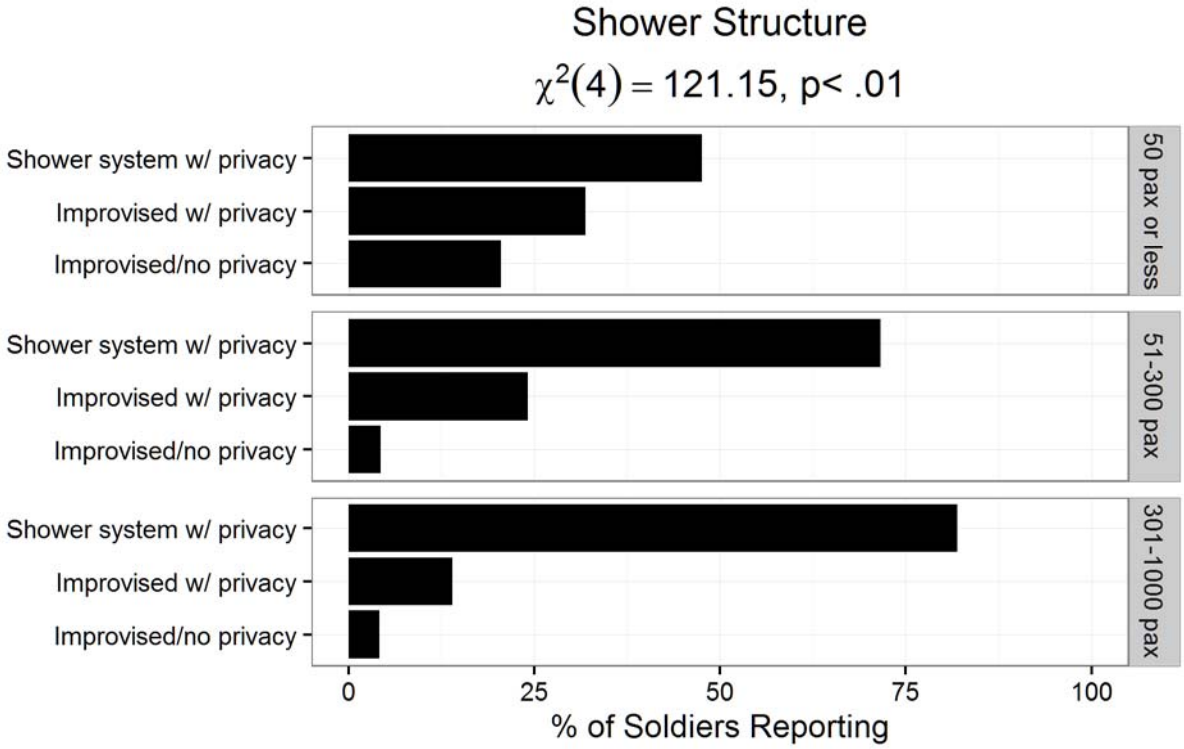

TV/DVD in Dining Area
$\chi^2(2) = 26.82$, p< .01
Yes
No
50 pax or less
Yes
No
51-300 pax
Yes
No
301-1000 pax
0
25
50
75
100
% of Soldiers Reporting

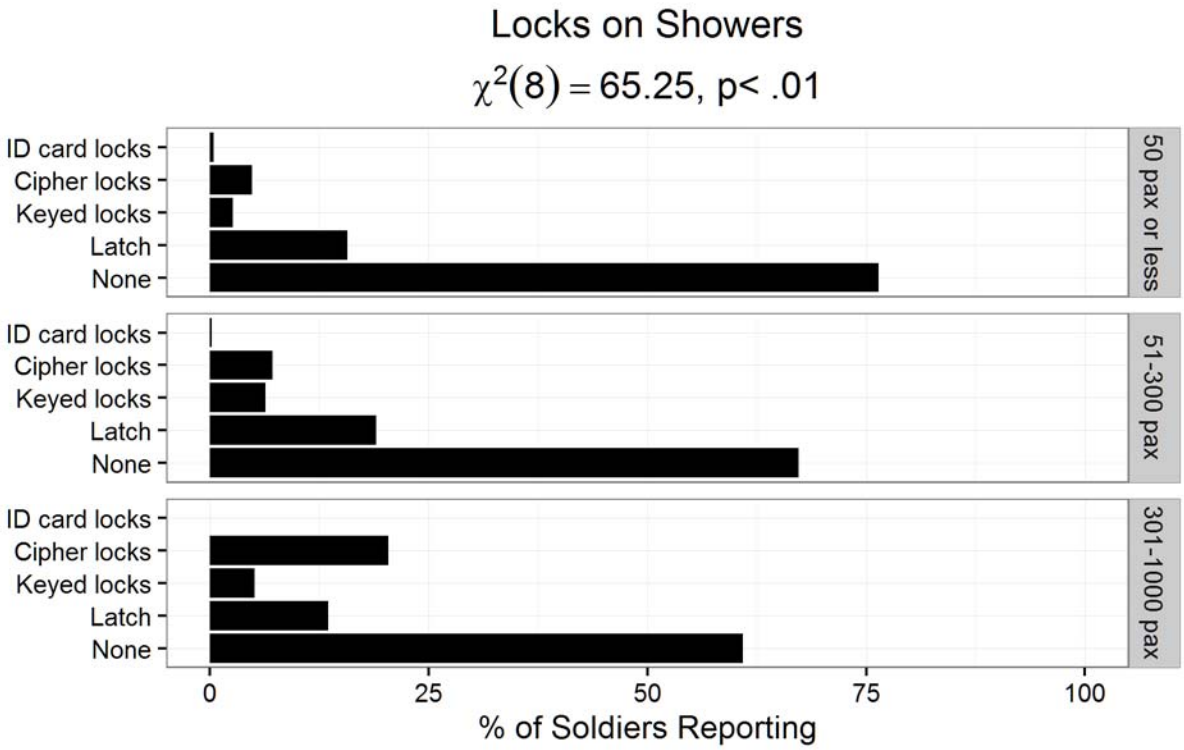

Shower Frequency
$\chi^2(10) = 144.23$, p< .01
Two or more times a day
Once per day
Once per week
Once every two weeks
Once every three weeks
Once every four weeks
50 pax or less
51-300 pax
301-1000 pax
0
25
50
75
100
% of Soldiers Reporting

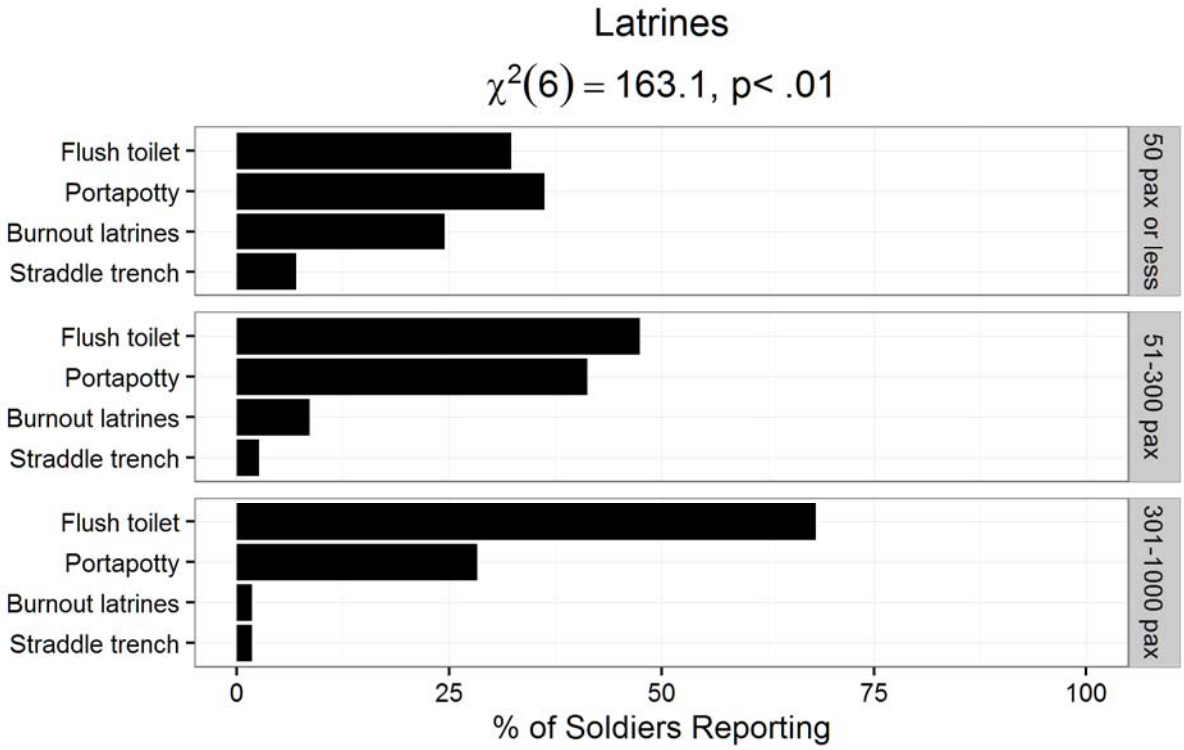

Shower Duration
$\chi^2(6) = 87.06$, p< .01
15 minutes
10 minutes
5 minutes
2 minutes
50 pax or less
51-300 pax
301-1000 pax
0
25
50
75
100
% of Soldiers Reporting

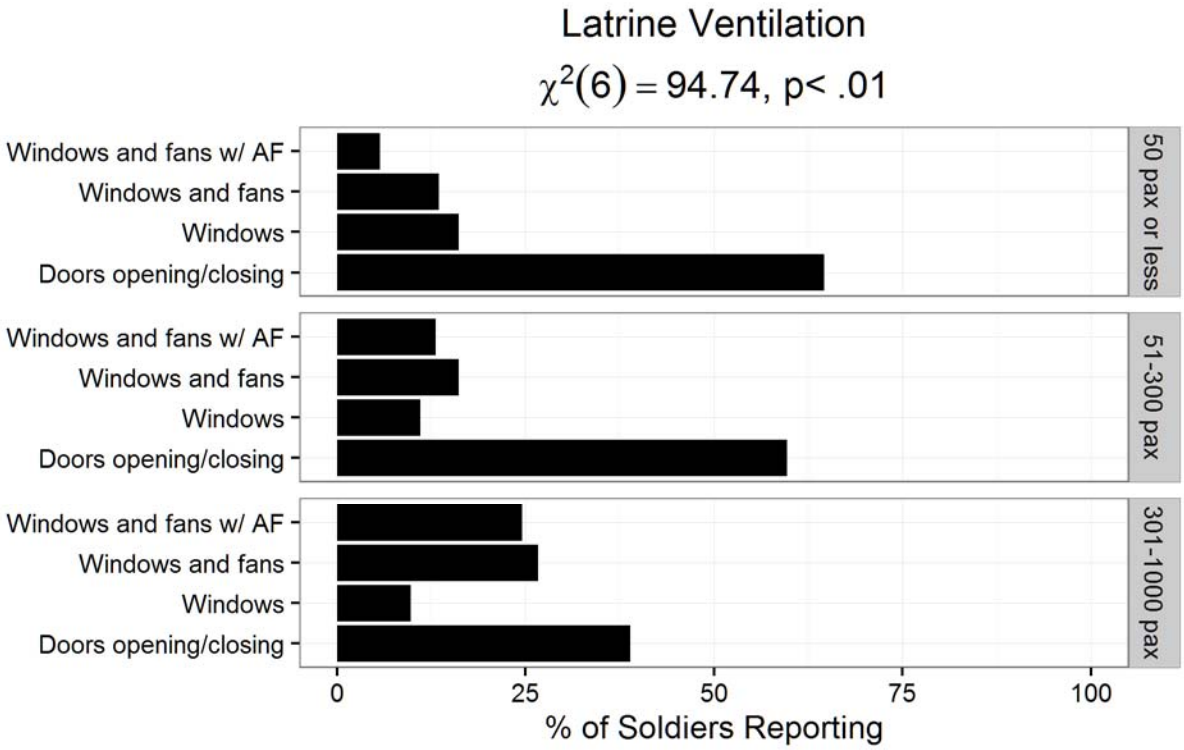

Shower Flow Rate
$\chi^2(2) = 144.32$, p< .01
Pressure fed
Gravity fed
50 pax or less
51-300 pax
301-1000 pax
0
25
50
75
100
% of Soldiers Reporting

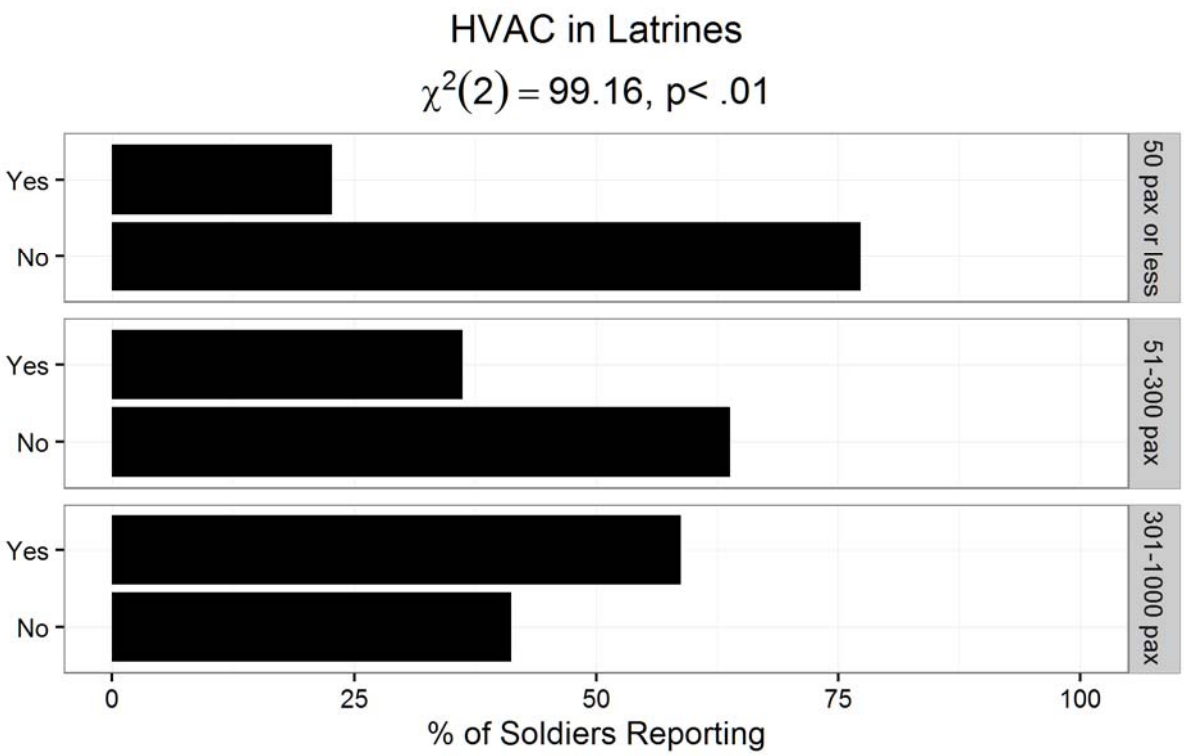

Shower Temperature Control
$\chi^2(4) = 166.52, p < .01$
Cool to hot
Cool to lukewarm
None
50 pax or less
51-300 pax
301-1000 pax
0
25
50
75
100
% of Soldiers Reporting


Shower Structure
$\chi^2(4) = 121.15, p < .01$
Shower system w/ privacy
Improvised w/ privacy
Improvised/no privacy
50 pax or less
51-300 pax
301-1000 pax
0
25
50
75
100
% of Soldiers Reporting


Locks on Showers
$\chi^2(8) = 65.25, p < .01$
ID card locks
Cipher locks
Keyed locks
Latch
None
50 pax or less
51-300 pax
301-1000 pax
0
25
50
75
100
% of Soldiers Reporting

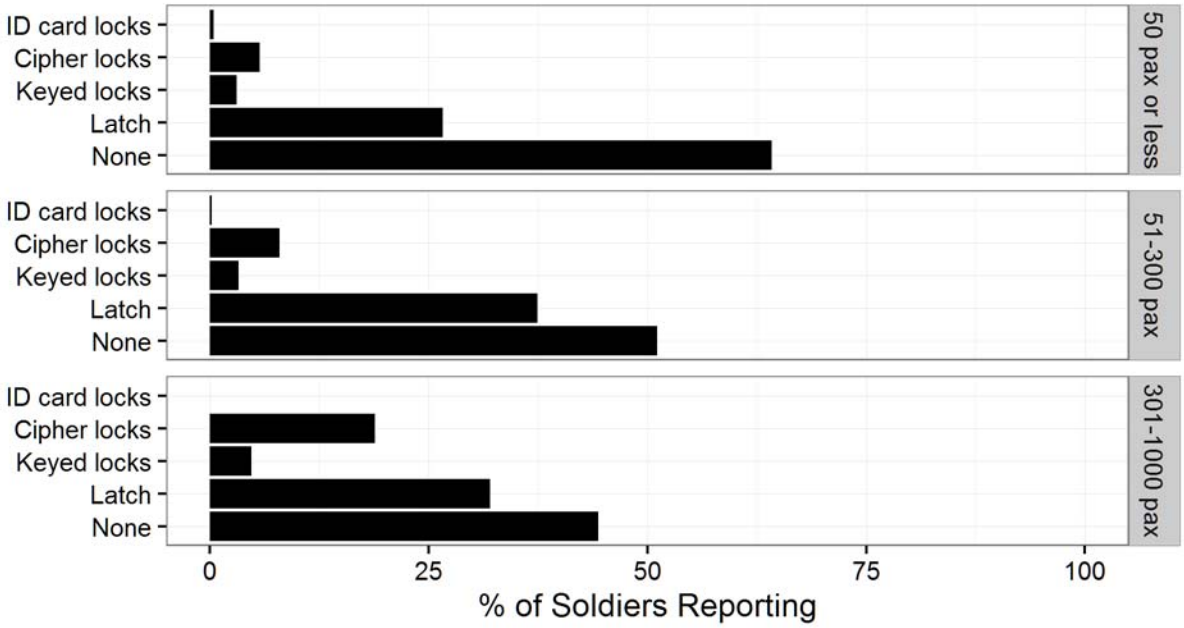

Latrines
$\chi^2(6) = 163.1, p < .01$
Flush toilet
Portapotty
Burnout latrines
Straddle trench
50 pax or less
51-300 pax
301-1000 pax
0
25
50
75
100
% of Soldiers Reporting


Latrine Ventilation
$\chi^2(6) = 94.74$, p< .01
Windows and fans w/ AF
Windows and fans
Windows
Doors opening/closing
50 pax or less
51-300 pax
301-1000 pax
0
25
50
75
100
% of Soldiers Reporting


HVAC in Latrines
$\chi^2(2) = 99.16$, p< .01
Yes
No
50 pax or less
51-300 pax
301-1000 pax
0
25
50
75
100
% of Soldiers Reporting

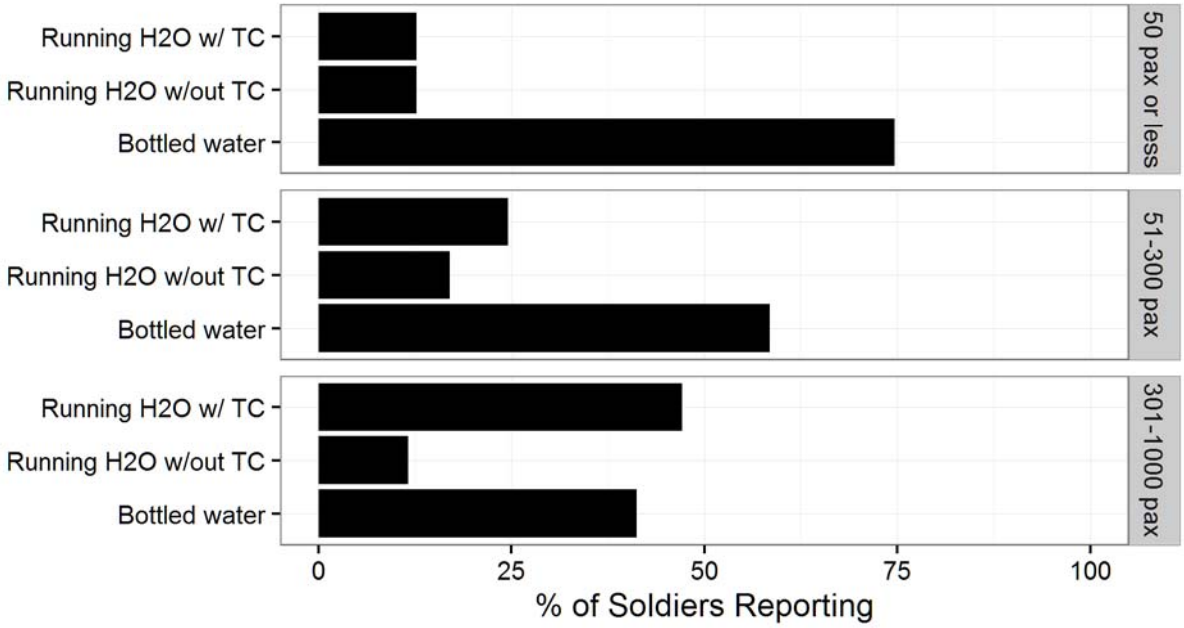
Locks on Latrines

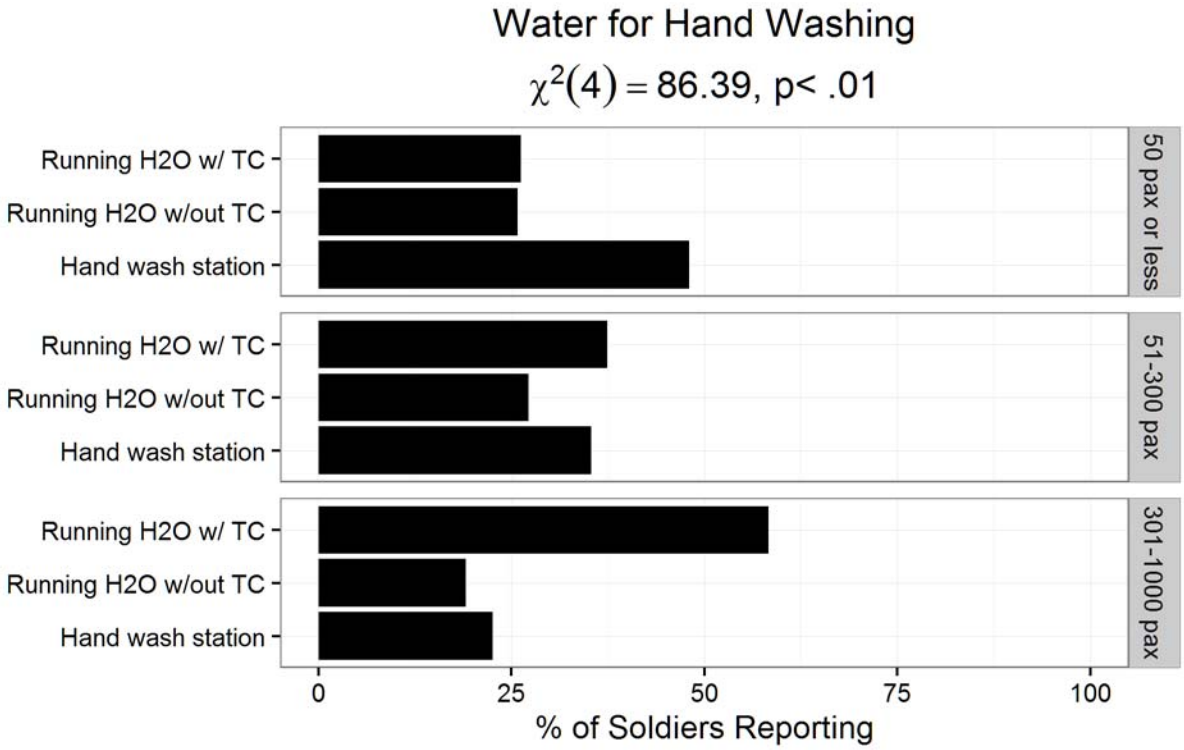
$\chi^2(8) = 55.76,\ p < .01$

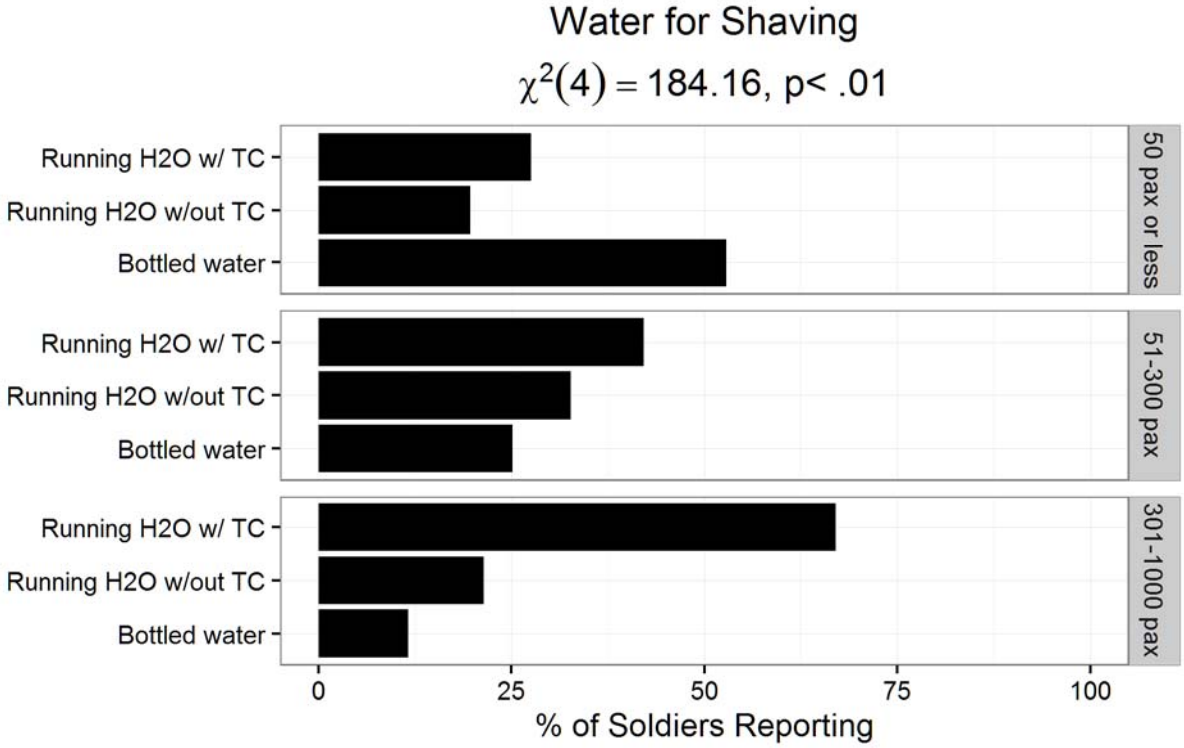


Water for Brushing Teeth

$\chi^2(4) = 112.91,\ p < .01$

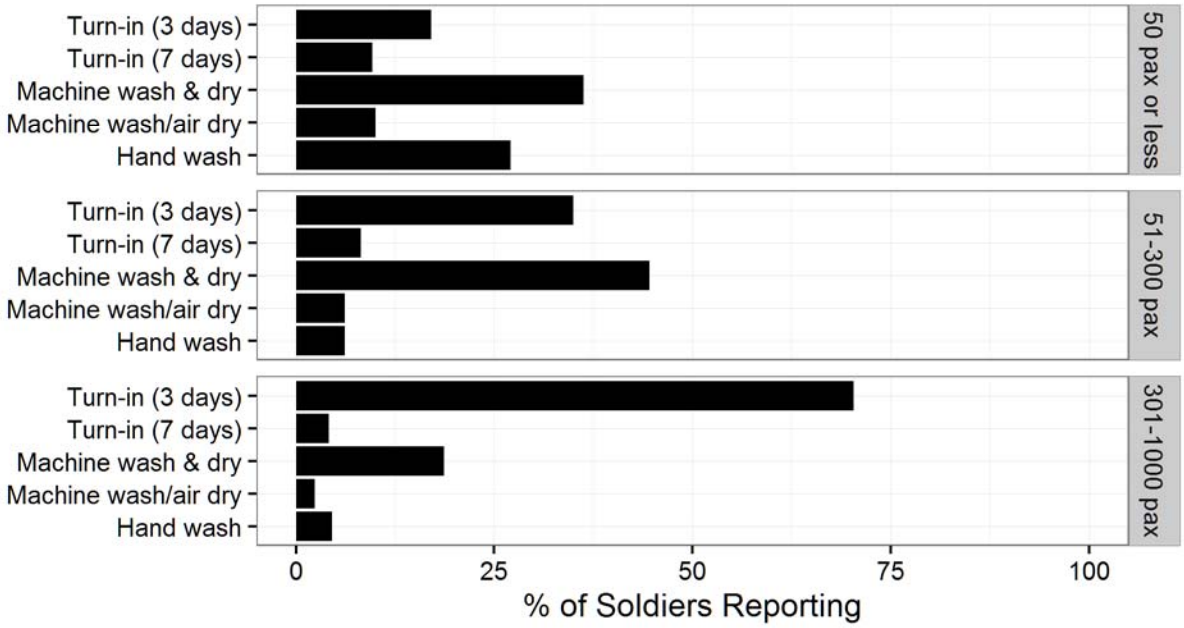



Water for Hand Washing
$\chi^2(4) = 86.39, p < .01$
Running H2O w/ TC
Running H2O w/out TC
Hand wash station
50 pax or less
51-300 pax
301-1000 pax
0
25
50
75
100
% of Soldiers Reporting


Water for Shaving
$\chi^2(4) = 184.16, p < .01$
Running H2O w/ TC
Running H2O w/out TC
Bottled water
50 pax or less
51-300 pax
301-1000 pax
0
25
50
75
100
% of Soldiers Reporting

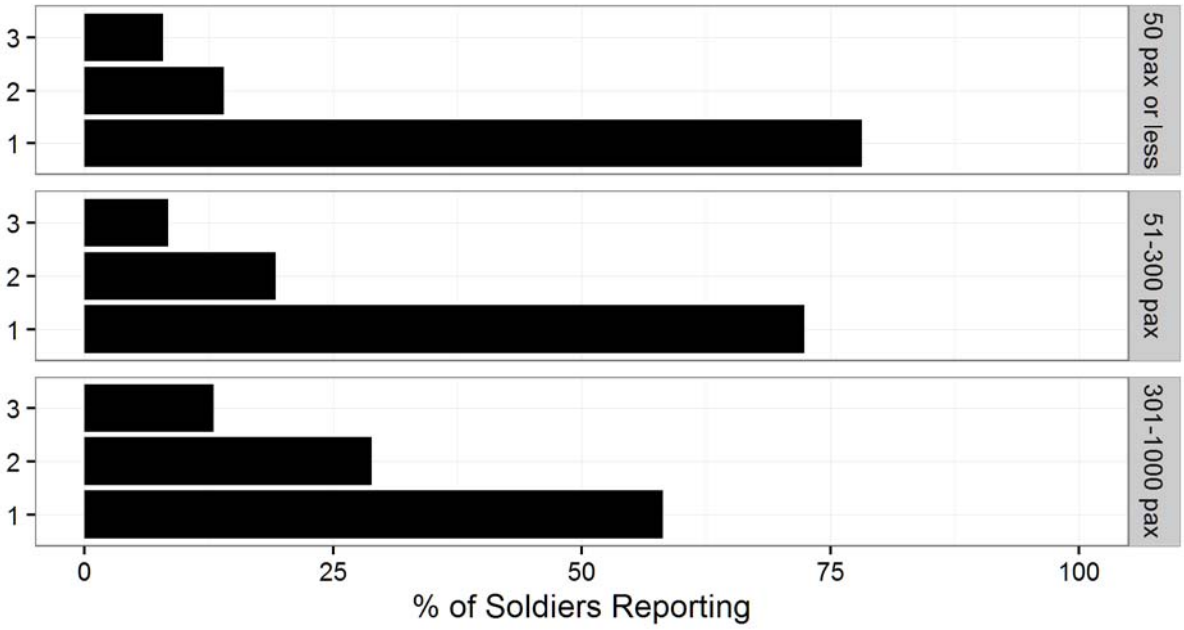
Laundry

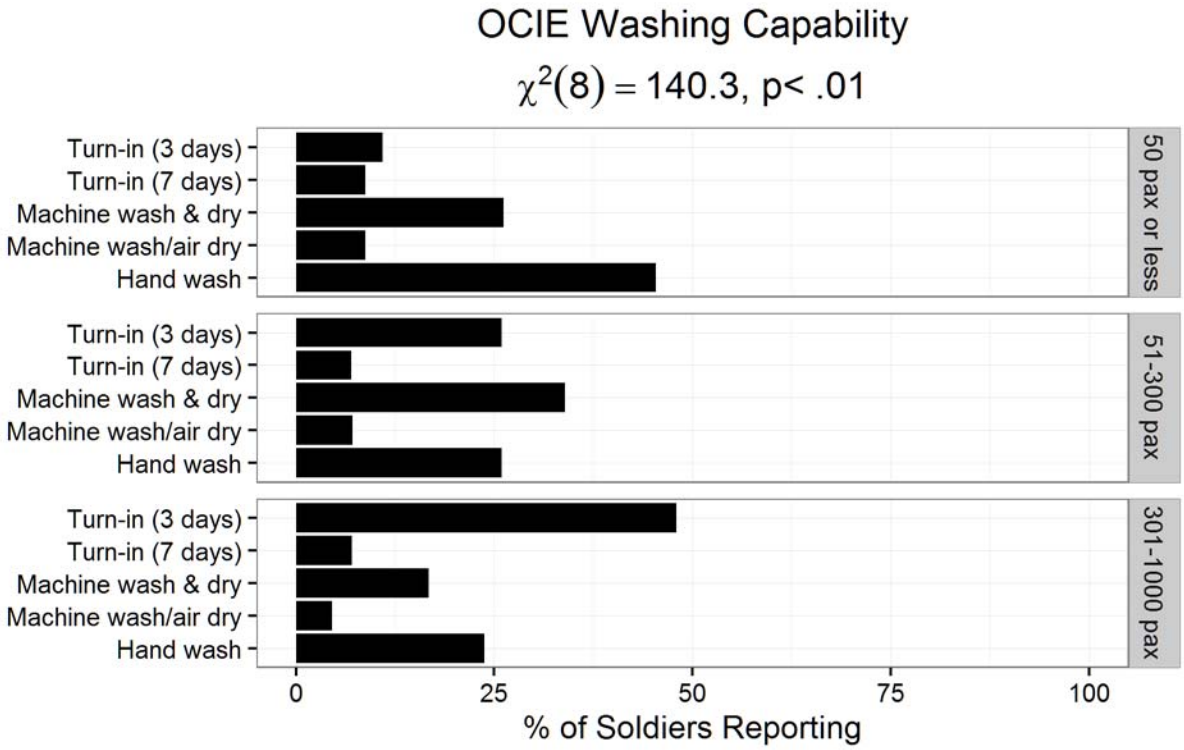
$\chi^2(8) = 295.67, p < .01$

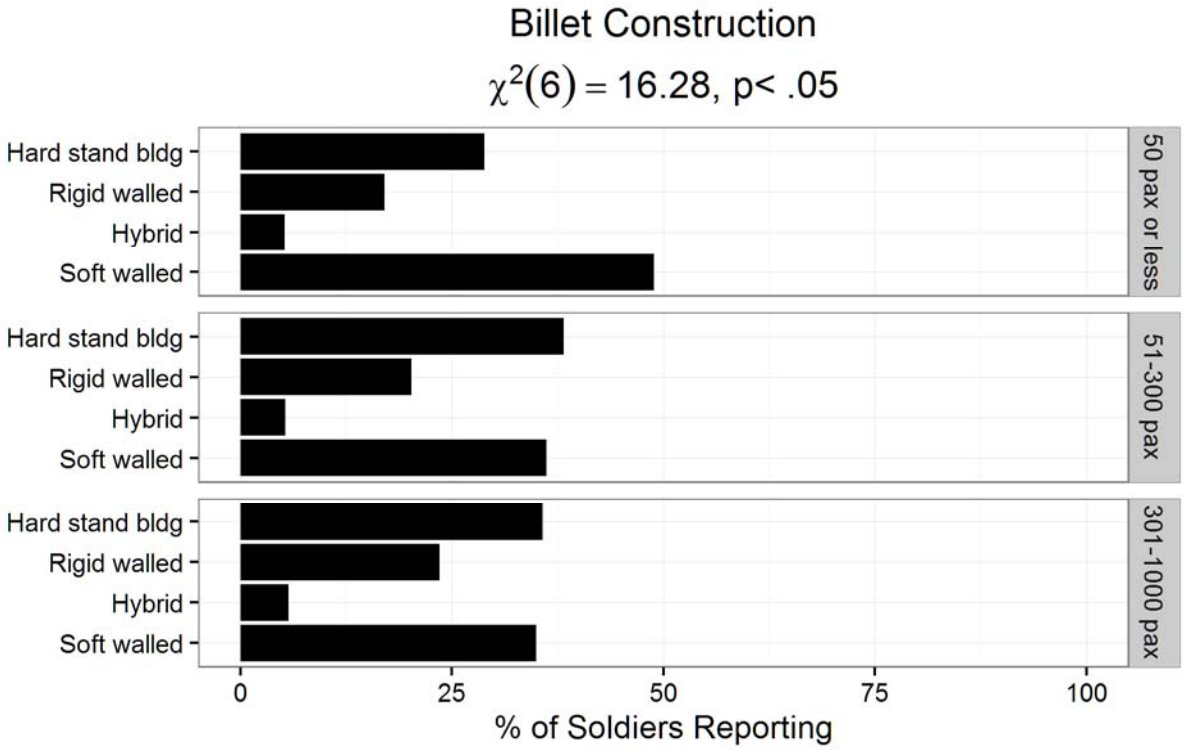


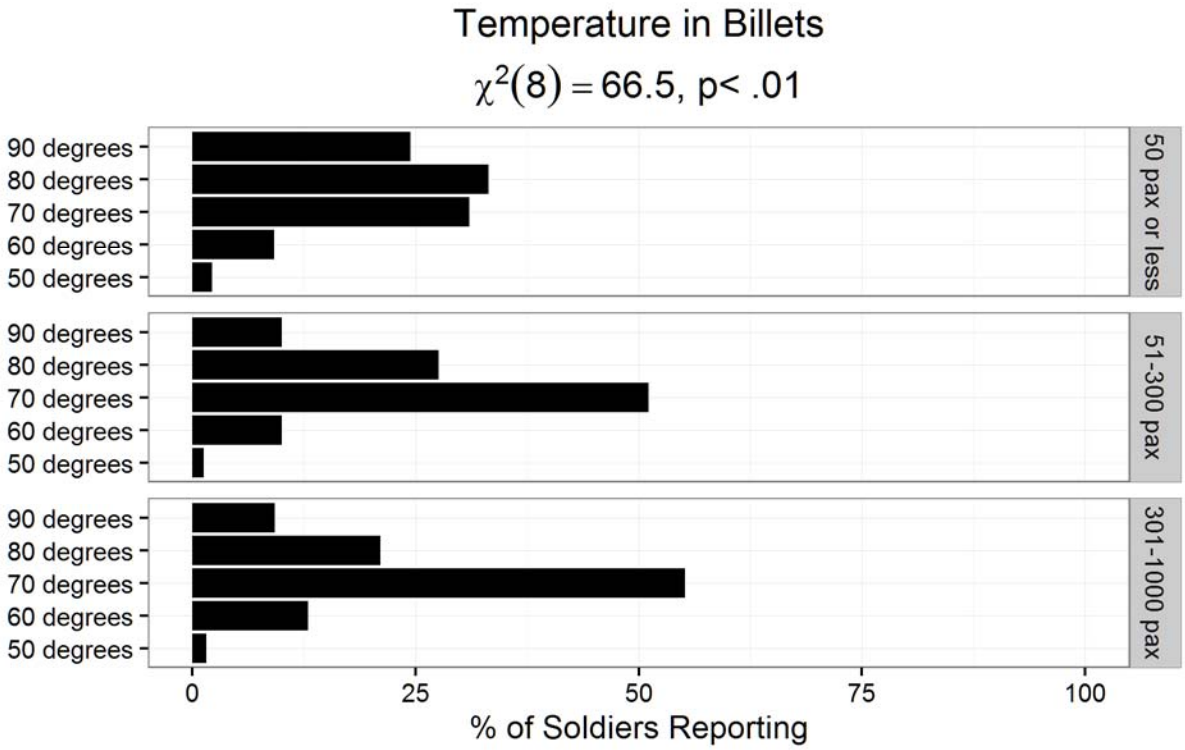
Bags of Laundry Per Use

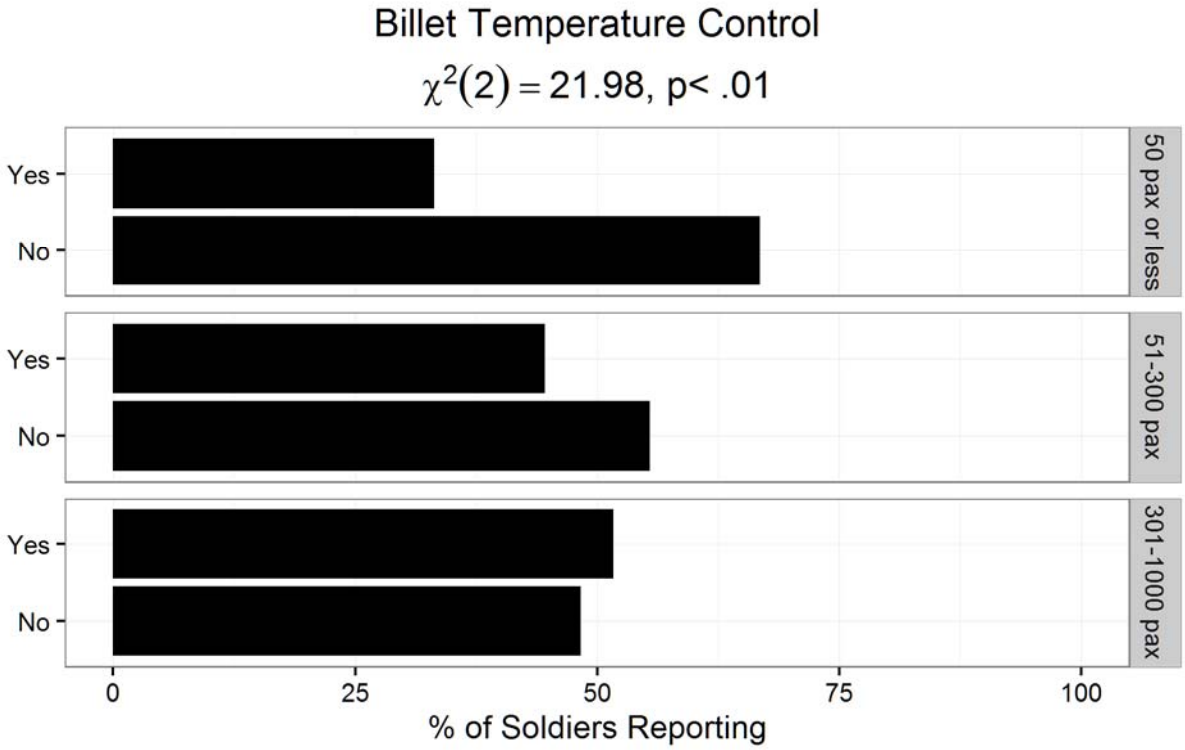
$\chi^2(4) = 37.93, p < .01$

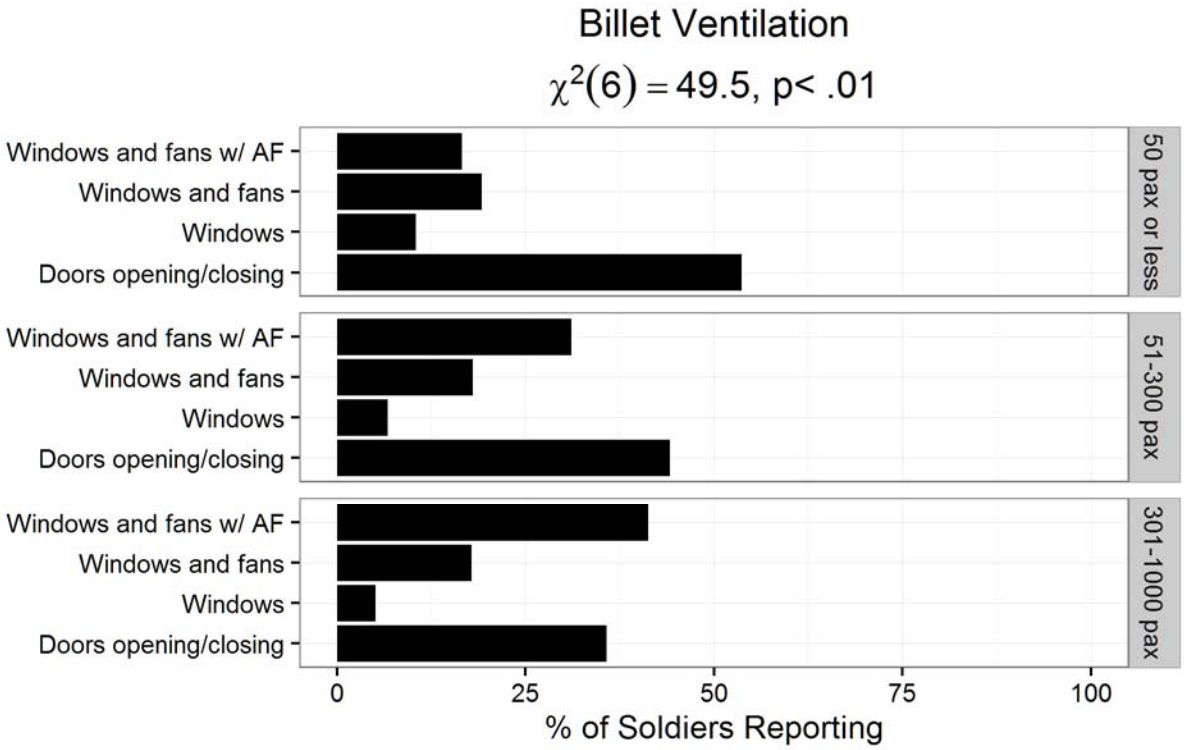


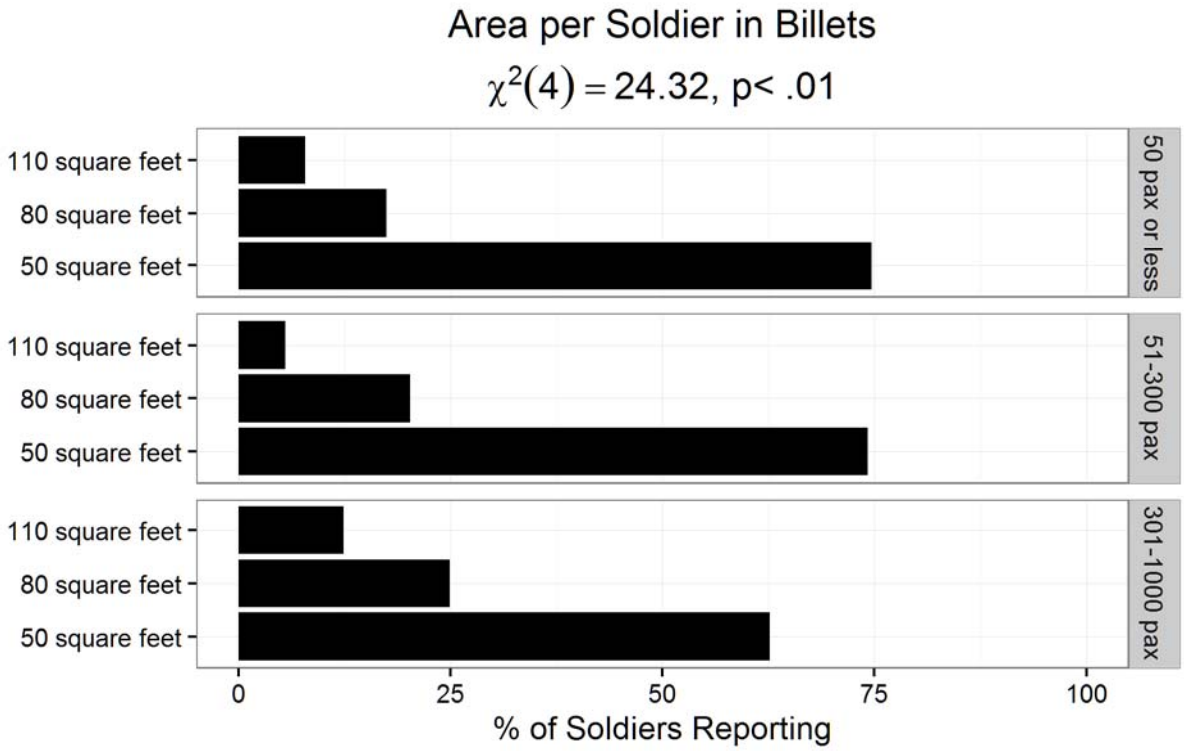

OCIE Washing Capability
$\chi^2(8) = 140.3, p < .01$
Turn-in (3 days)
Turn-in (7 days)
Machine wash & dry
Machine wash/air dry
Hand wash
50 pax or less
51-300 pax
301-1000 pax
0
25
50
75
100
% of Soldiers Reporting

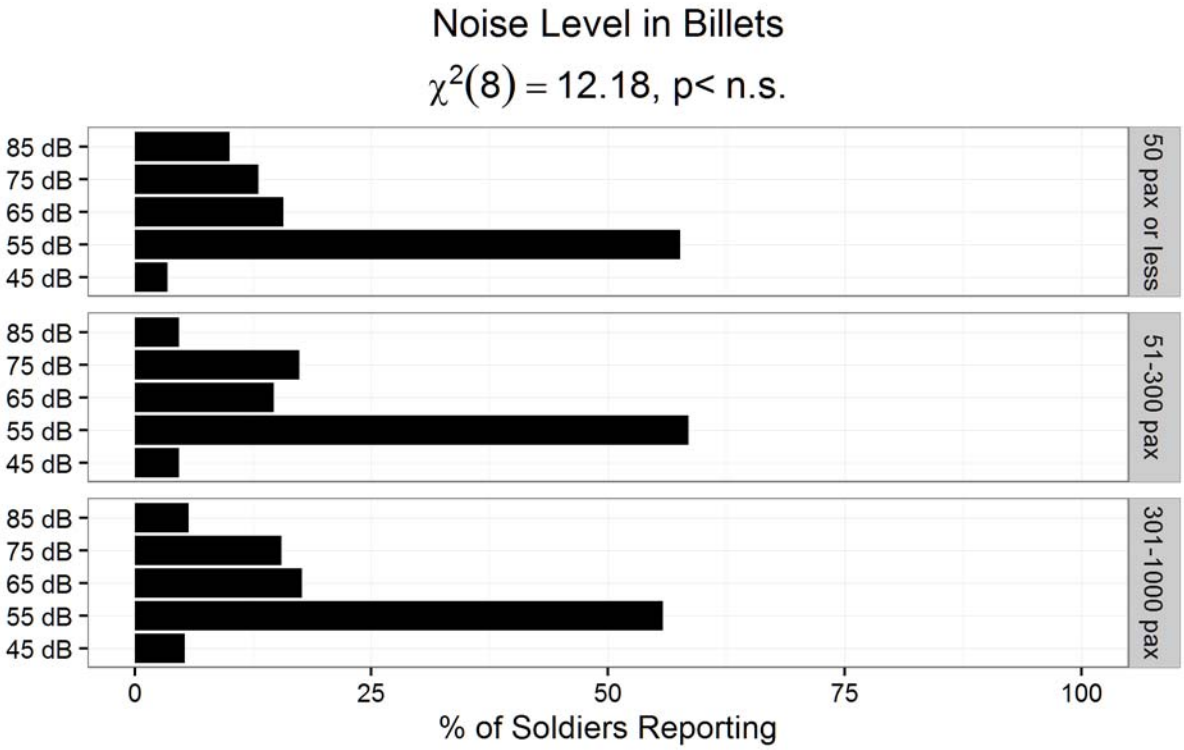

Billet Construction
$\chi^2(6) = 16.28, p < .05$
Hard stand bldg
Rigid walled
Hybrid
Soft walled
50 pax or less
51-300 pax
301-1000 pax
0
25
50
75
100
% of Soldiers Reporting

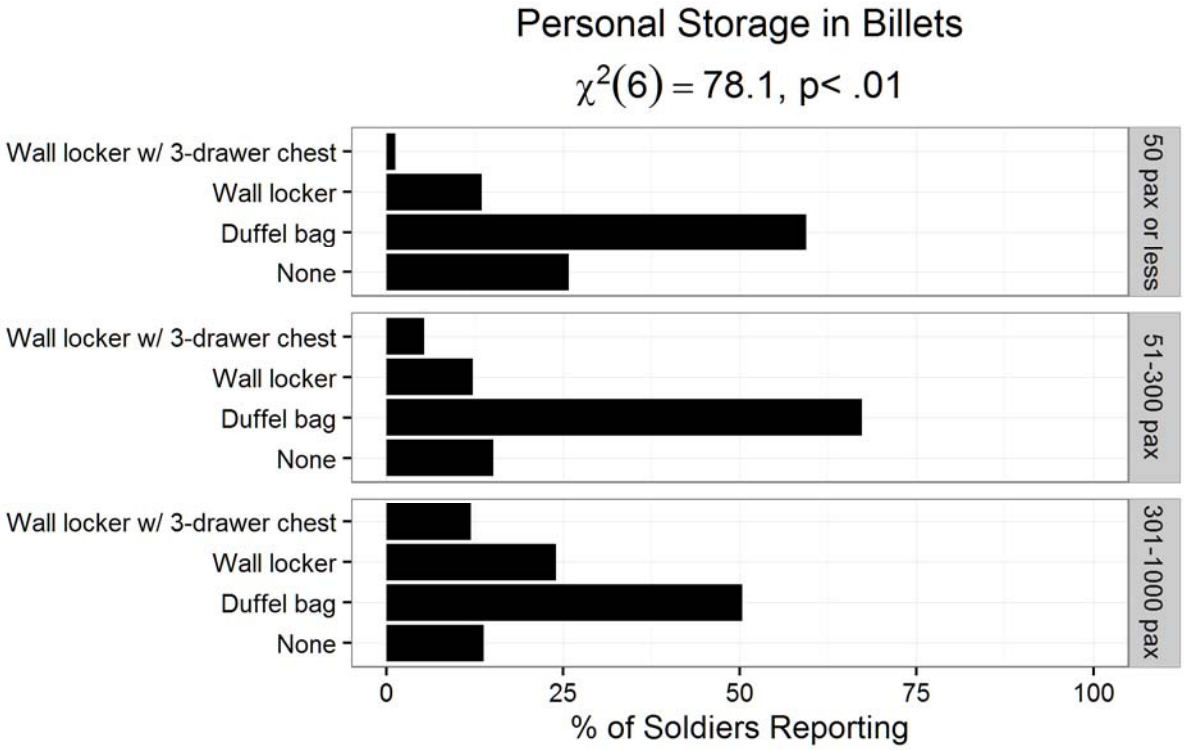

Temperature in Billets
$\chi^2(8) = 66.5, p < .01$
90 degrees
80 degrees
70 degrees
60 degrees
50 degrees
50 pax or less
51-300 pax
301-1000 pax
0
25
50
75
100
% of Soldiers Reporting

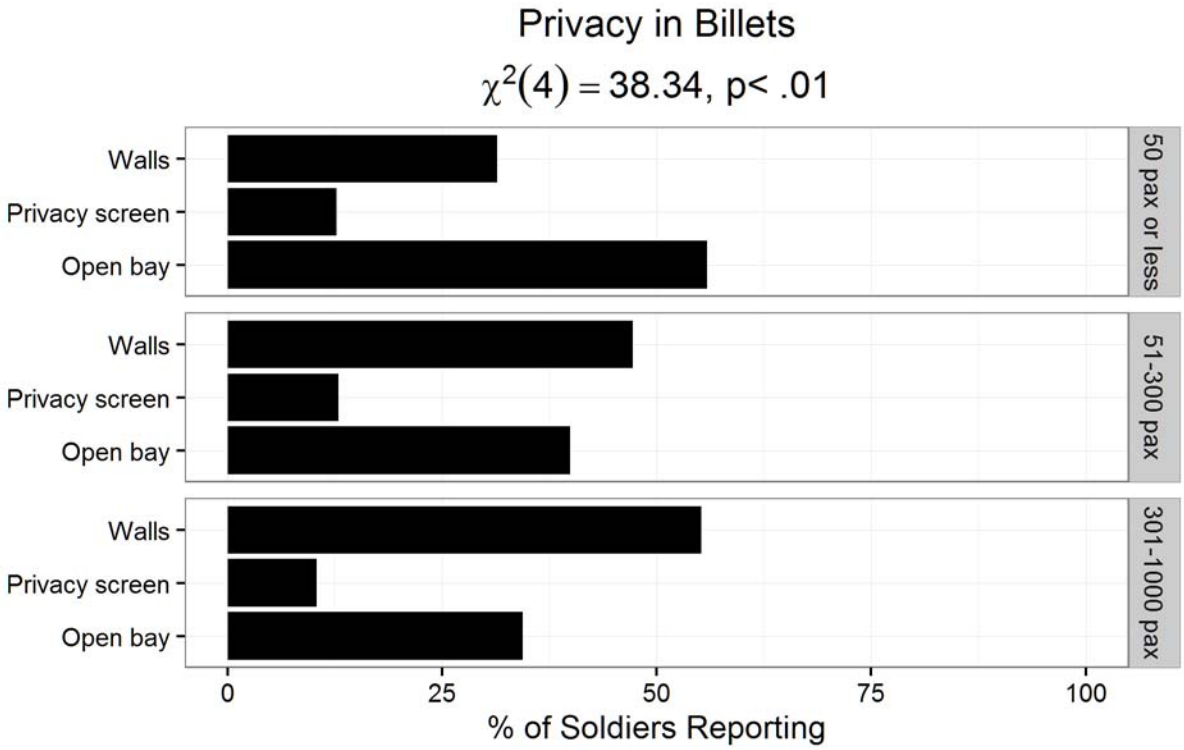

Billet Temperature Control
$\chi^2(2) = 21.98, p < .01$
Yes
No
50 pax or less
51-300 pax
301-1000 pax
0
25
50
75
100
% of Soldiers Reporting

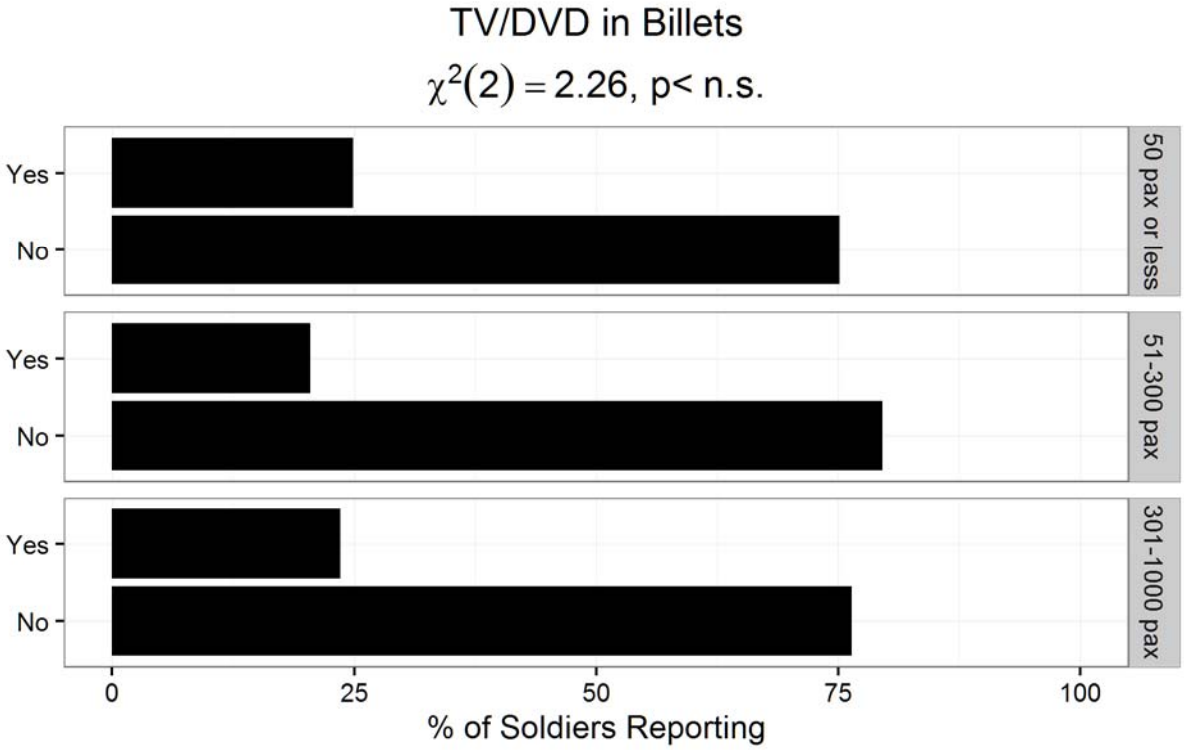

Billet Ventilation
$\chi^2(6) = 49.5, p < .01$
Windows and fans w/ AF
Windows and fans
Windows
Doors opening/closing
50 pax or less
51-300 pax
301-1000 pax
0
25
50
75
100
% of Soldiers Reporting

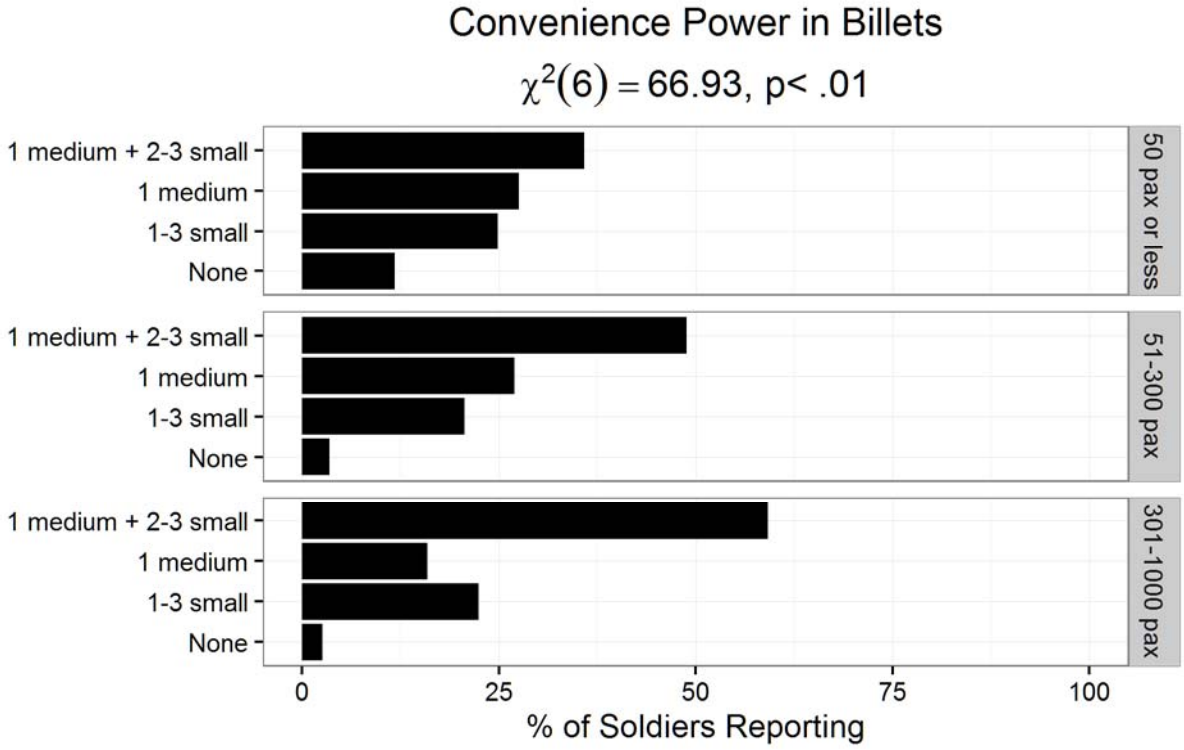

Area per Soldier in Billets
$\chi^2(4) = 24.32, p < .01$
110 square feet
80 square feet
50 square feet
50 pax or less
51-300 pax
301-1000 pax
0
25
50
75
100
% of Soldiers Reporting

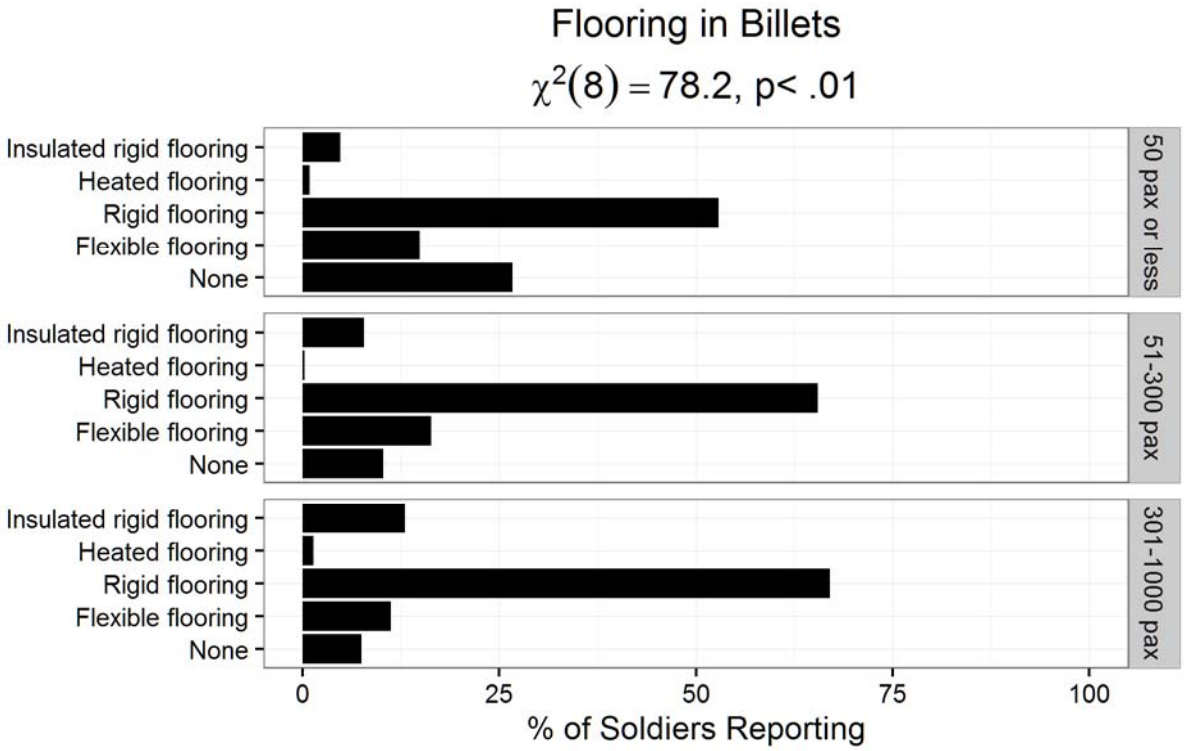

Noise Level in Billets
$\chi^2(8) = 12.18$, p< n.s.
85 dB
75 dB
65 dB
55 dB
45 dB
50 pax or less
51-300 pax
301-1000 pax
0
25
50
75
100
% of Soldiers Reporting

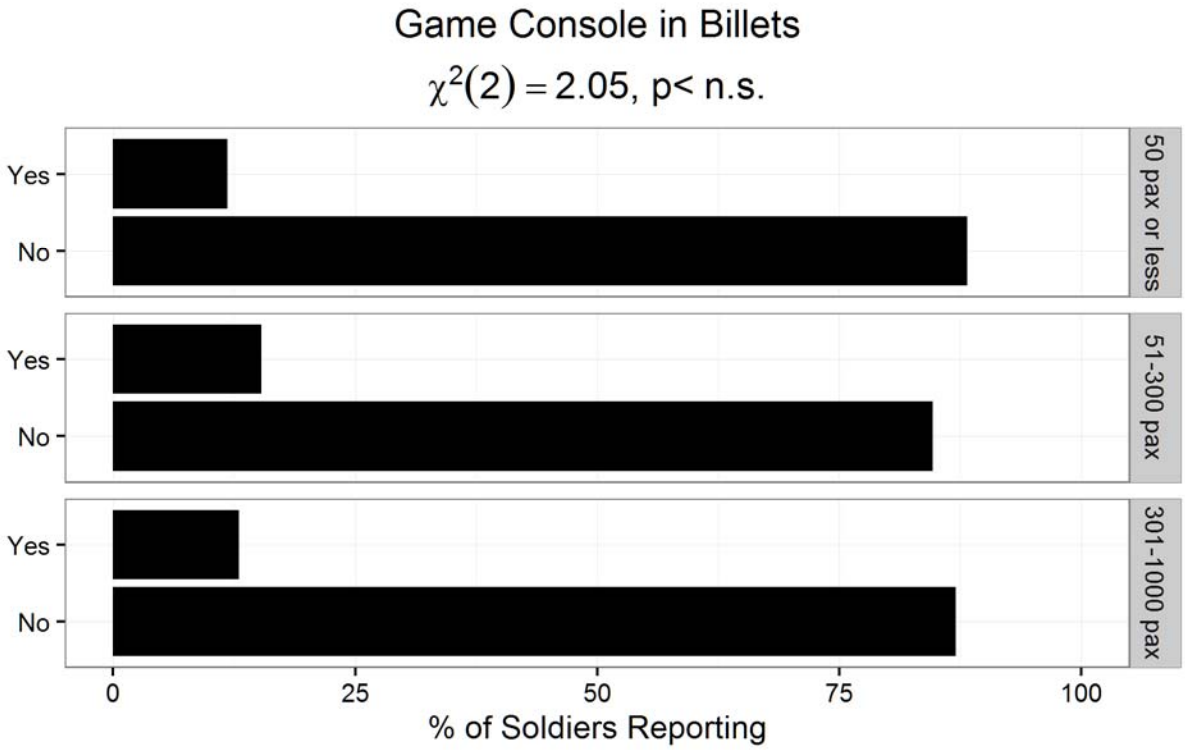

Personal Storage in Billets
$\chi^2(6) = 78.1$, p< .01
Wall locker w/ 3-drawer chest
Wall locker
Duffel bag
None
50 pax or less
51-300 pax
301-1000 pax
0
25
50
75
100
% of Soldiers Reporting

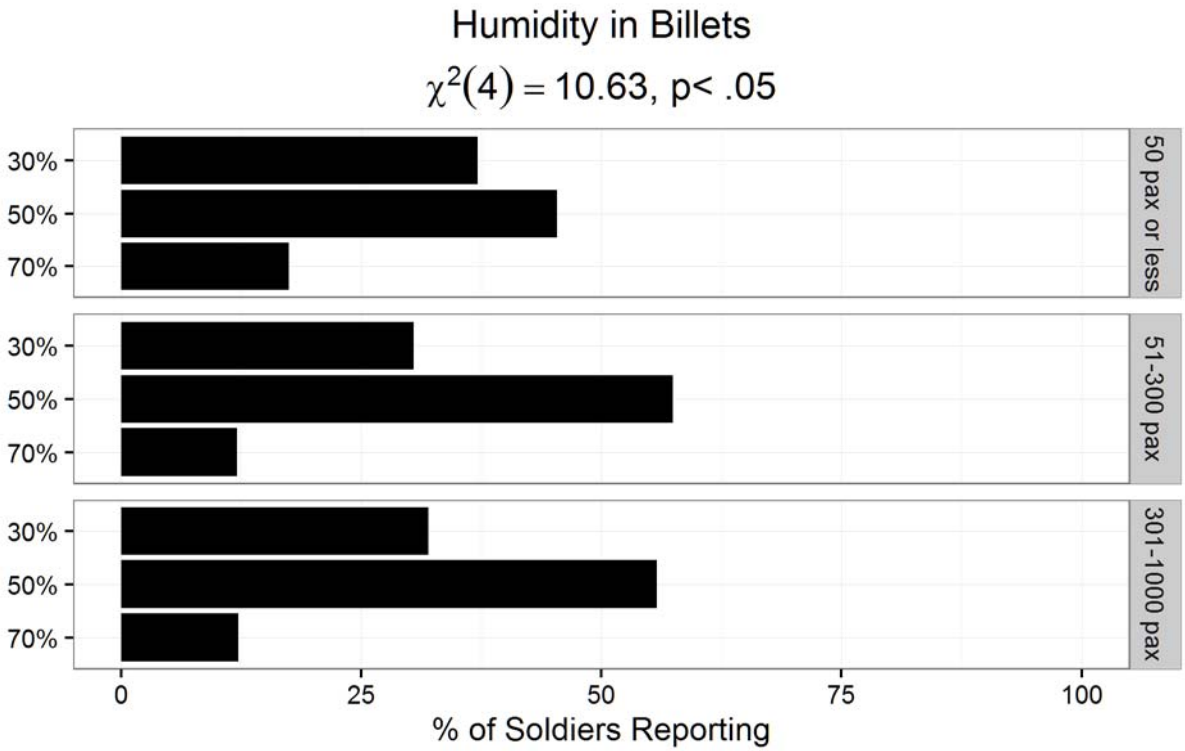

Privacy in Billets
$\chi^2(4) = 38.34$, p< .01
Walls
Privacy screen
Open bay
50 pax or less
51-300 pax
301-1000 pax
0
25
50
75
100
% of Soldiers Reporting

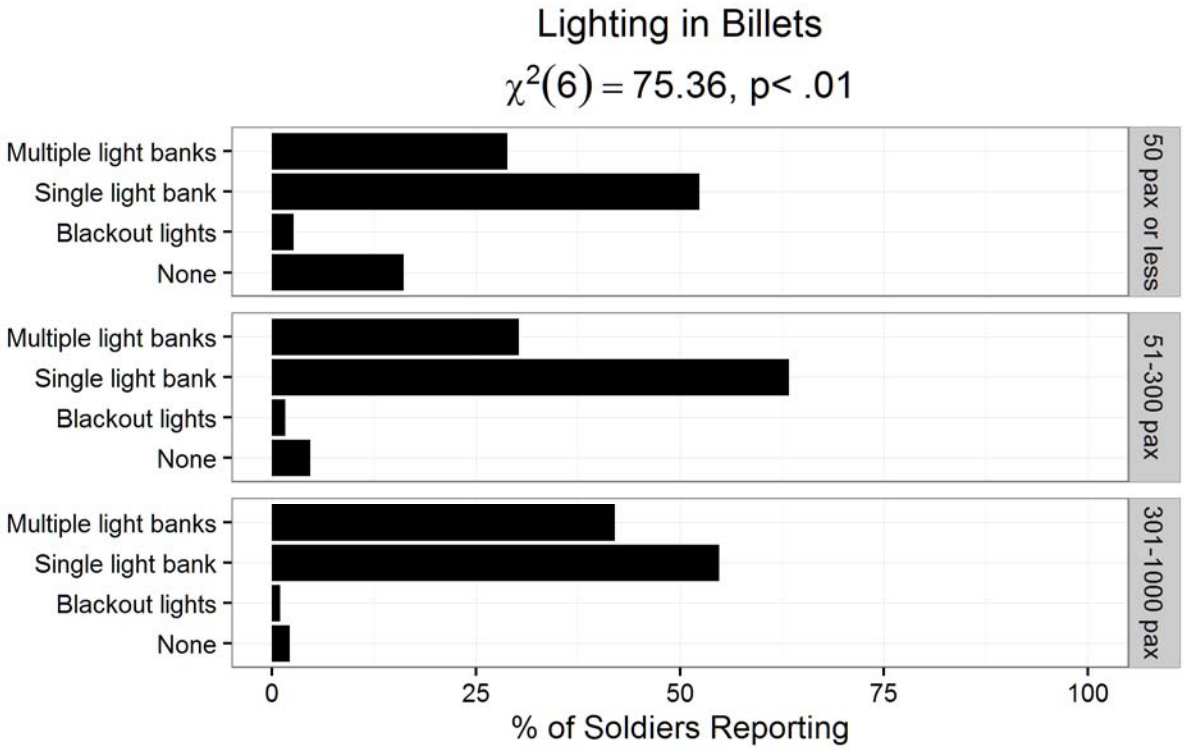

TV/DVD in Billets
$\chi^2(2) = 2.26$, p< n.s.
Yes
No
50 pax or less
51-300 pax
301-1000 pax
0
25
50
75
100
% of Soldiers Reporting

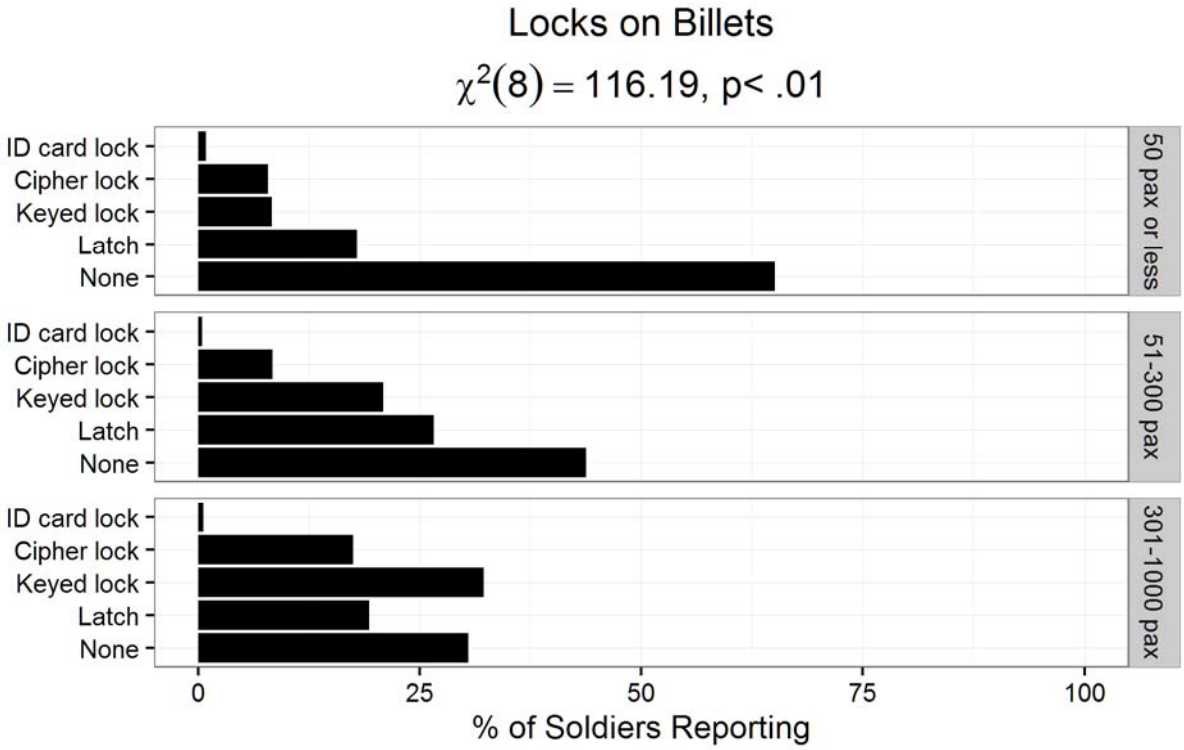

Convenience Power in Billets
$\chi^2(6) = 66.93, p < .01$
1 medium + 2-3 small
1 medium
1-3 small
None
50 pax or less
51-300 pax
301-1000 pax
0
25
50
75
100
% of Soldiers Reporting

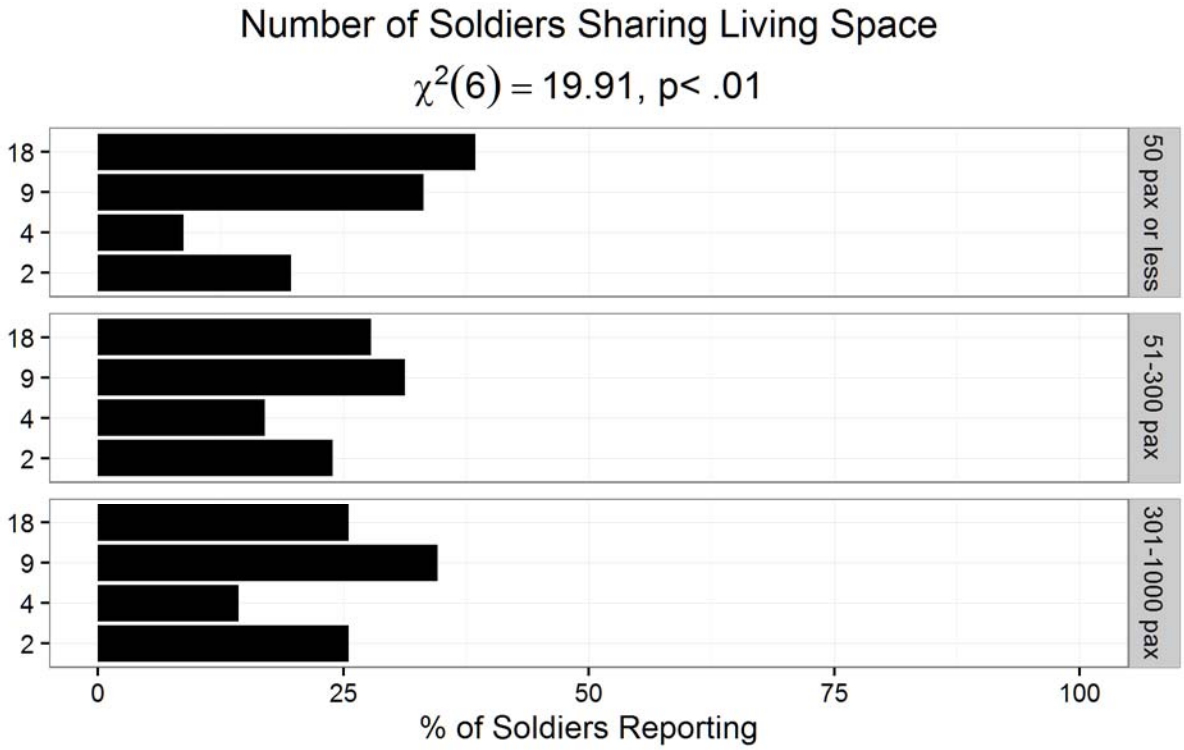

Flooring in Billets
$\chi^2(8) = 78.2, p < .01$
Insulated rigid flooring
Heated flooring
Rigid flooring
Flexible flooring
None
50 pax or less
51-300 pax
301-1000 pax
0
25
50
75
100
% of Soldiers Reporting

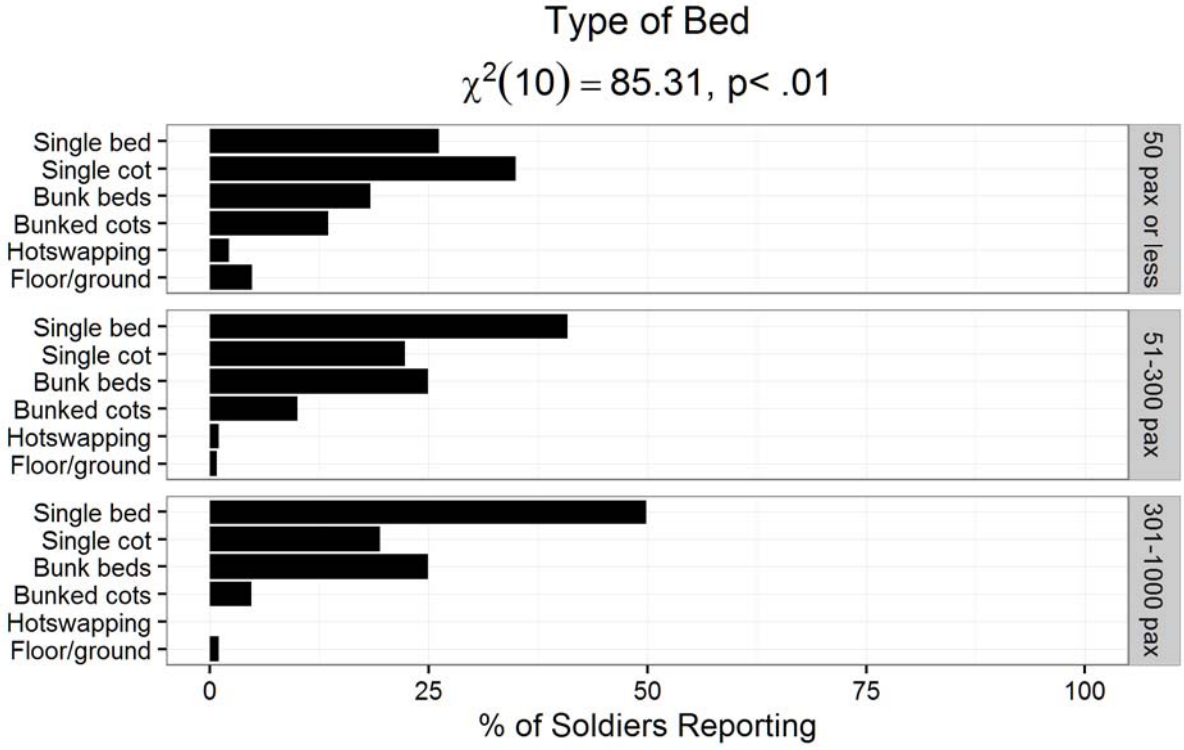

Game Console in Billets
$\chi^2(2) = 2.05$, p< n.s.
Yes
No
50 pax or less
Yes
No
51-300 pax
Yes
No
301-1000 pax
0
25
50
75
100
% of Soldiers Reporting

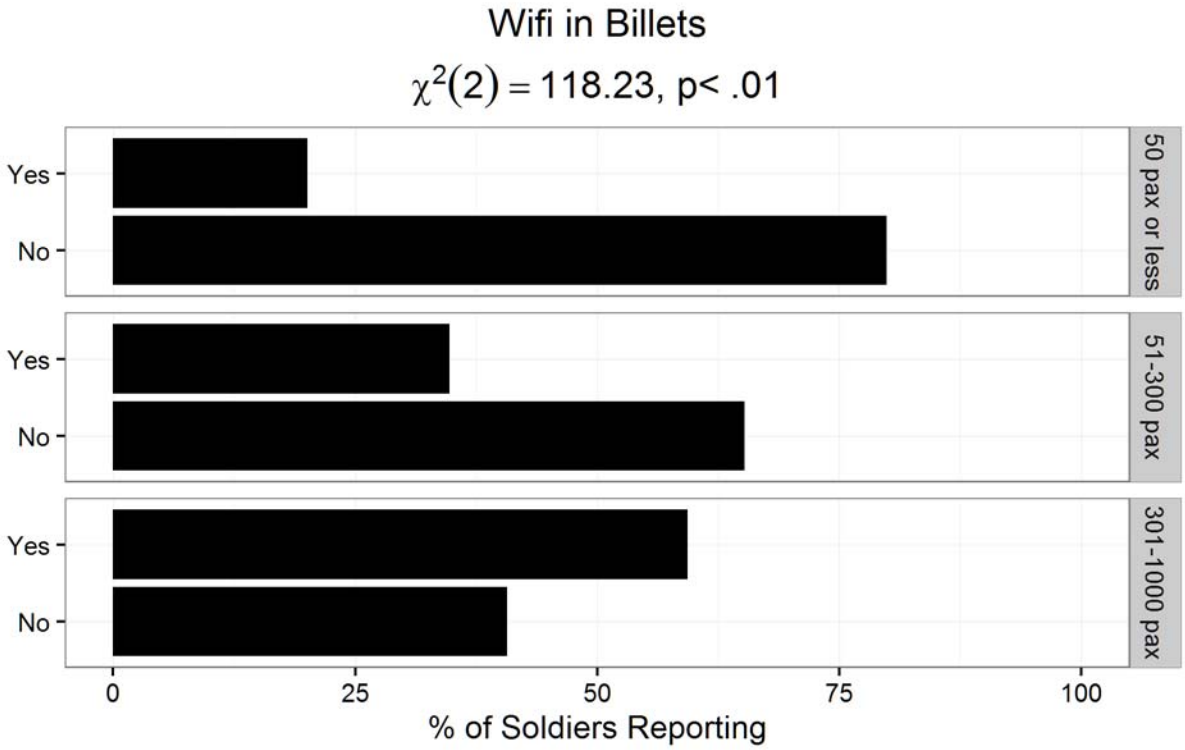

Humidity in Billets
$\chi^2(4) = 10.63$, p< .05
30%
50%
70%
50 pax or less
30%
50%
70%
51-300 pax
30%
50%
70%
301-1000 pax
0
25
50
75
100
% of Soldiers Reporting

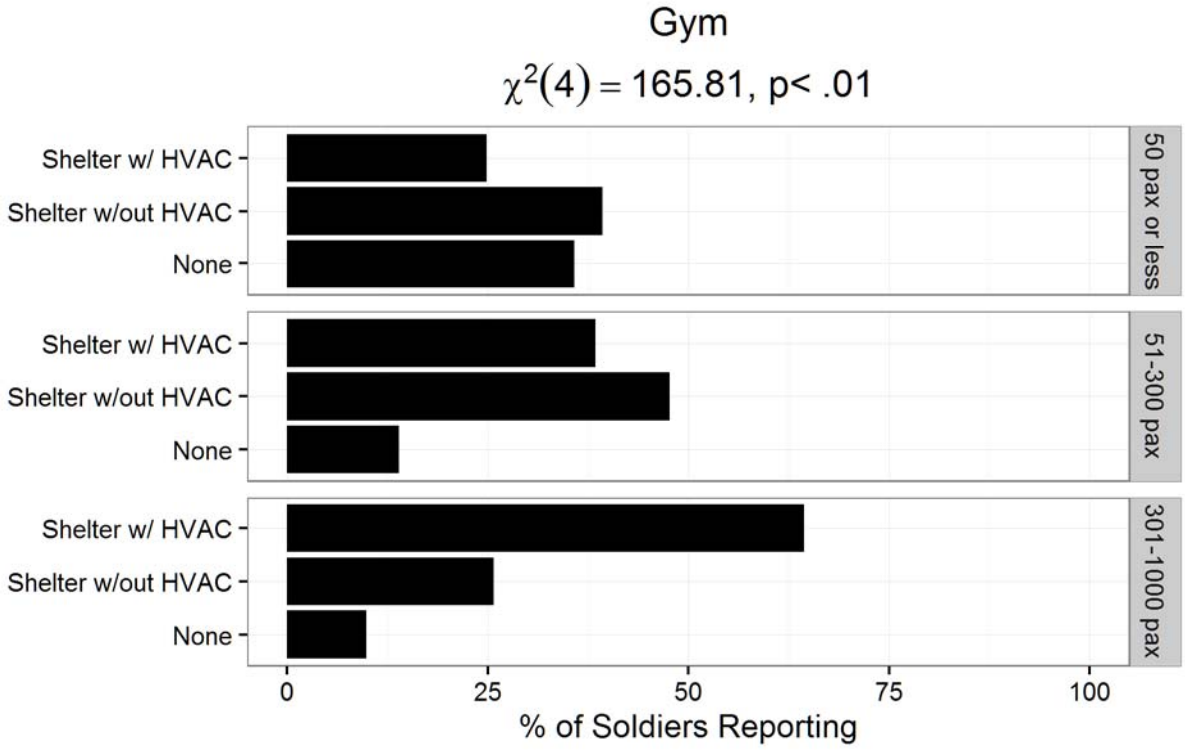

Lighting in Billets
$\chi^2(6) = 75.36, p < .01$
Multiple light banks
Single light bank
Blackout lights
None
50 pax or less
51-300 pax
301-1000 pax
0
25
50
75
100
% of Soldiers Reporting

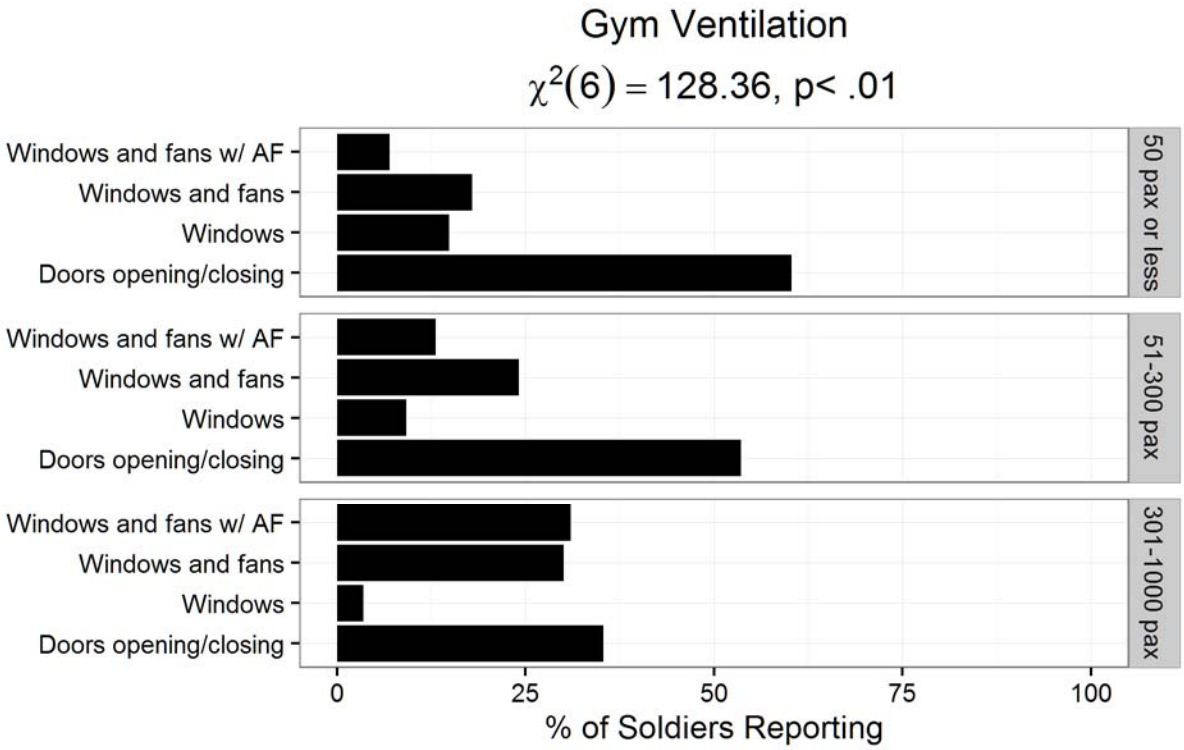

Locks on Billets
$\chi^2(8) = 116.19, p < .01$
ID card lock
Cipher lock
Keyed lock
Latch
None
50 pax or less
51-300 pax
301-1000 pax
0
25
50
75
100
% of Soldiers Reporting

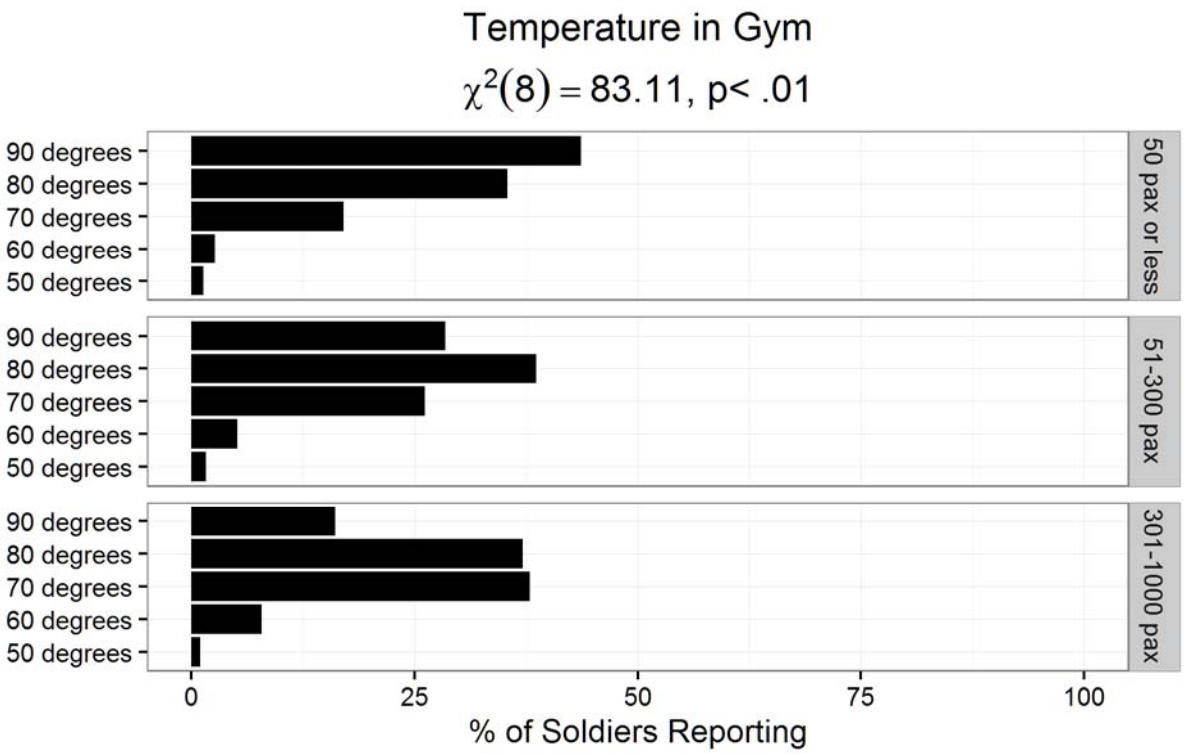

Number of Soldiers Sharing Living Space
$\chi^2(6) = 19.91, p < .01$
18
9
4
2
50 pax or less
51-300 pax
301-1000 pax
0
25
50
75
100
% of Soldiers Reporting

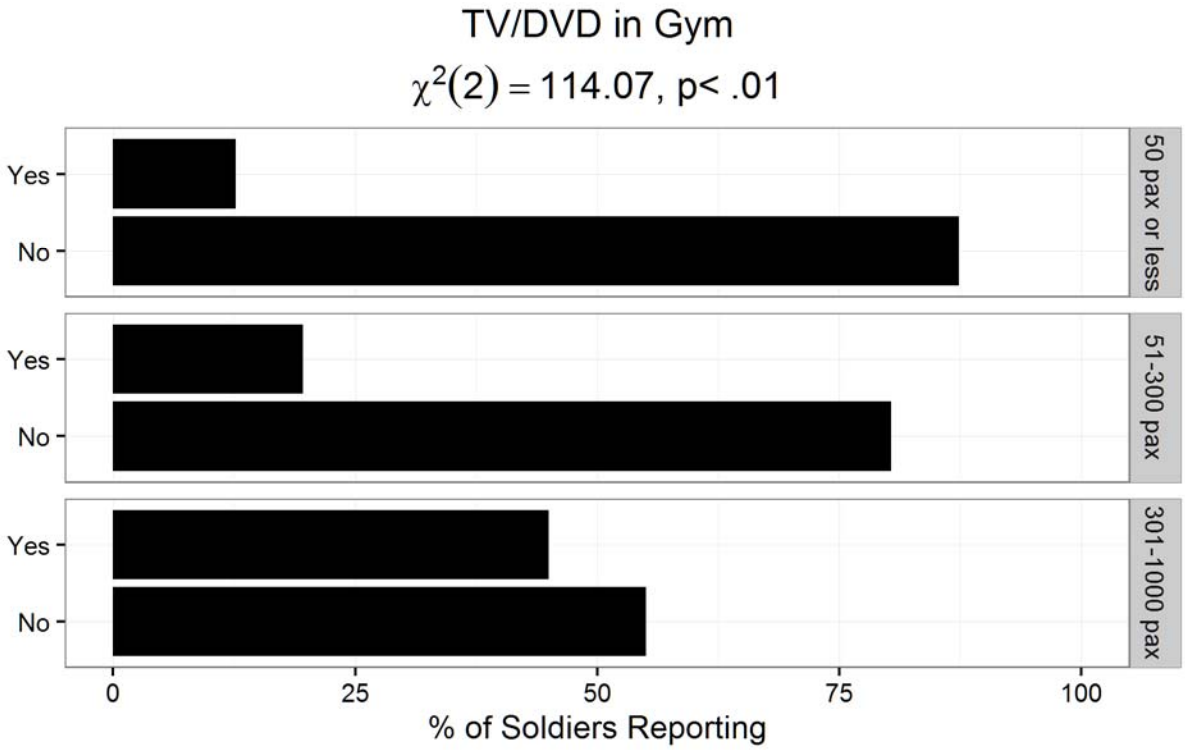

Type of Bed
$\chi^2(10) = 85.31, p < .01$
Single bed
Single cot
Bunk beds
Bunked cots
Hotswapping
Floor/ground
50 pax or less
51-300 pax
301-1000 pax
0
25
50
75
100
% of Soldiers Reporting

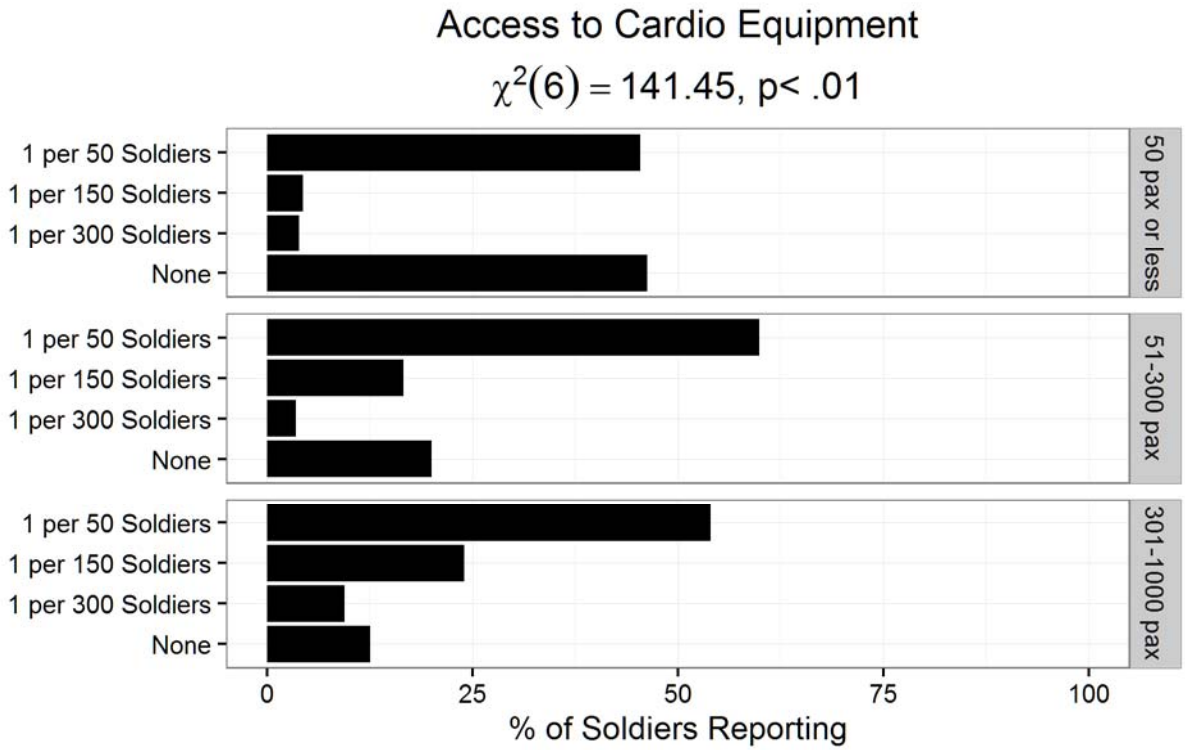

Wifi in Billets
$\chi^2(2) = 118.23$, p< .01
Yes
No
50 pax or less
Yes
No
51-300 pax
Yes
No
301-1000 pax
0
25
50
75
100
% of Soldiers Reporting

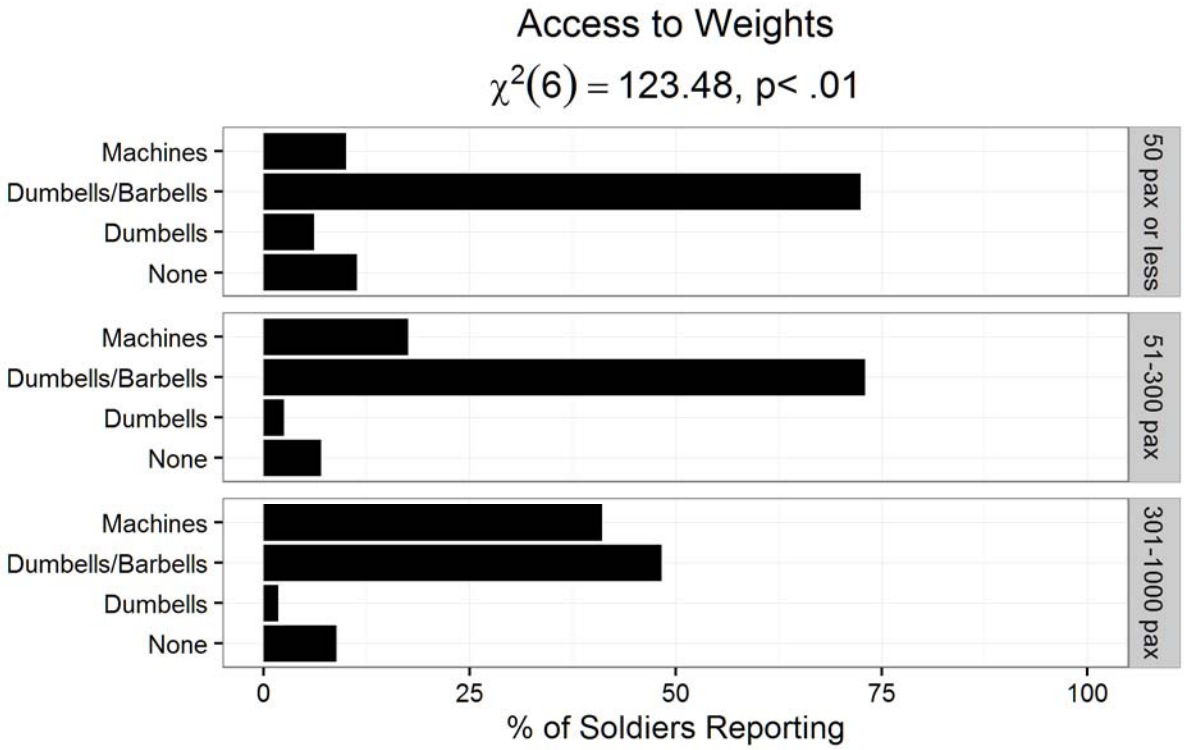

Gym
$\chi^2(4) = 165.81$, p< .01
Shelter w/ HVAC
Shelter w/out HVAC
None
50 pax or less
Shelter w/ HVAC
Shelter w/out HVAC
None
51-300 pax
Shelter w/ HVAC
Shelter w/out HVAC
None
301-1000 pax
0
25
50
75
100
% of Soldiers Reporting

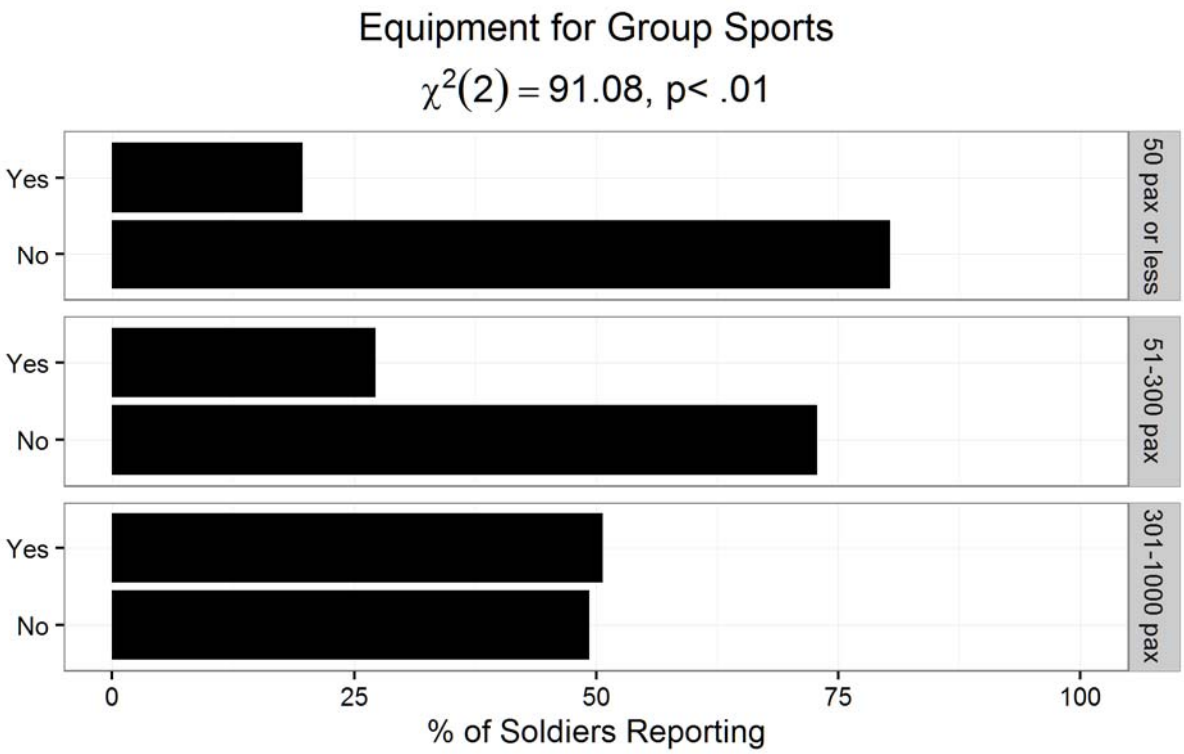

Gym Ventilation
$\chi^2(6) = 128.36, p < .01$
Windows and fans w/ AF
Windows and fans
Windows
Doors opening/closing
50 pax or less
51-300 pax
301-1000 pax
0
25
50
75
100
% of Soldiers Reporting

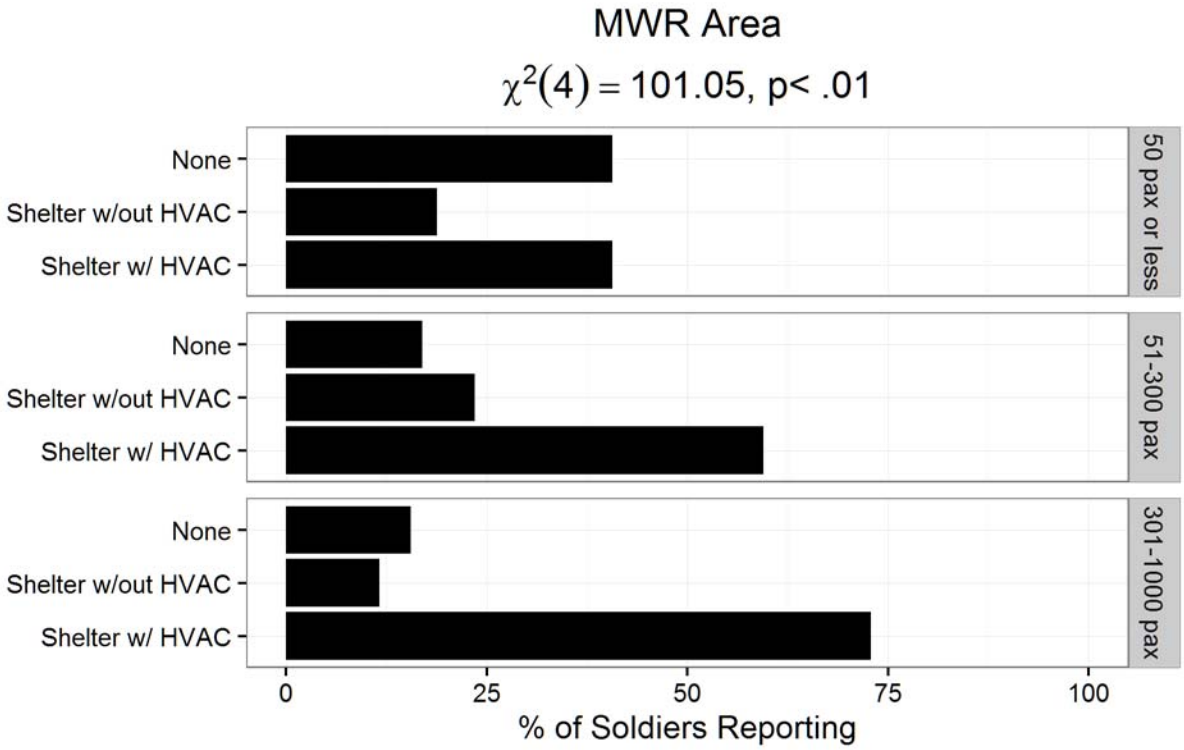

Temperature in Gym
$\chi^2(8) = 83.11, p < .01$
90 degrees
80 degrees
70 degrees
60 degrees
50 degrees
50 pax or less
51-300 pax
301-1000 pax
0
25
50
75
100
% of Soldiers Reporting

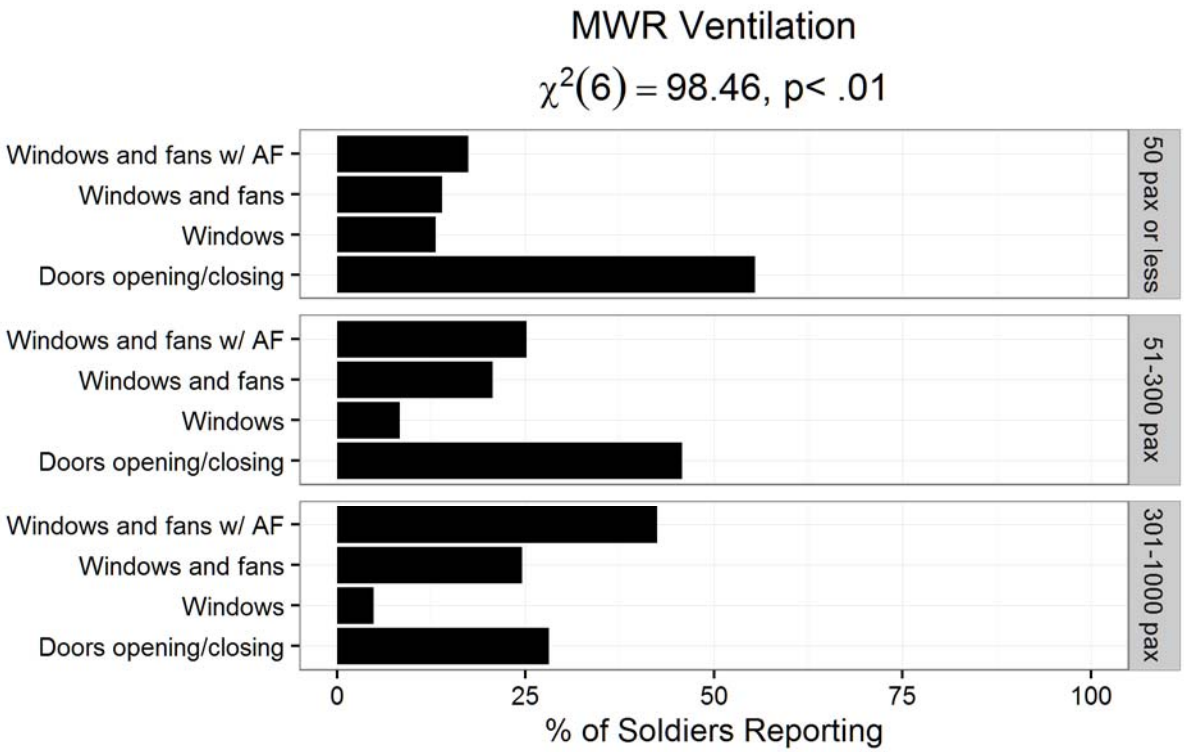

TV/DVD in Gym
$\chi^2(2) = 114.07$, p< .01
Yes
No
50 pax or less
Yes
No
51-300 pax
Yes
No
301-1000 pax
0
25
50
75
100
% of Soldiers Reporting

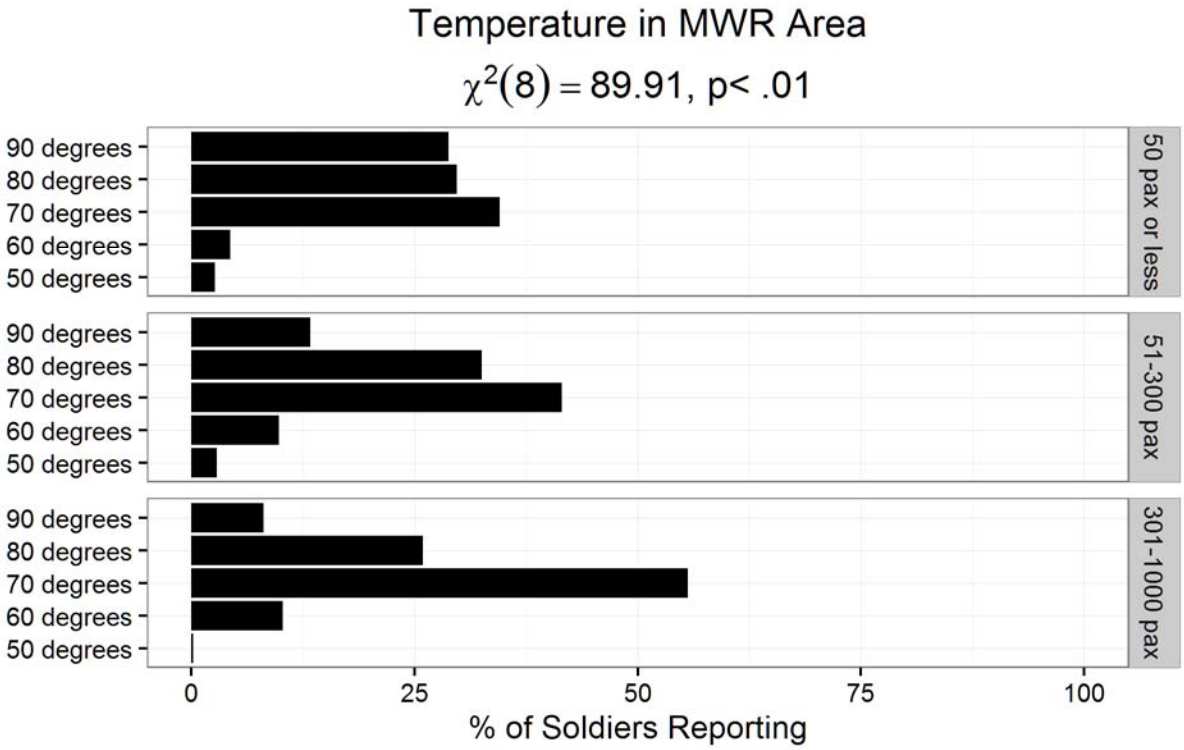

Access to Cardio Equipment
$\chi^2(6) = 141.45$, p< .01
1 per 50 Soldiers
1 per 150 Soldiers
1 per 300 Soldiers
None
50 pax or less
1 per 50 Soldiers
1 per 150 Soldiers
1 per 300 Soldiers
None
51-300 pax
1 per 50 Soldiers
1 per 150 Soldiers
1 per 300 Soldiers
None
301-1000 pax
0
25
50
75
100
% of Soldiers Reporting

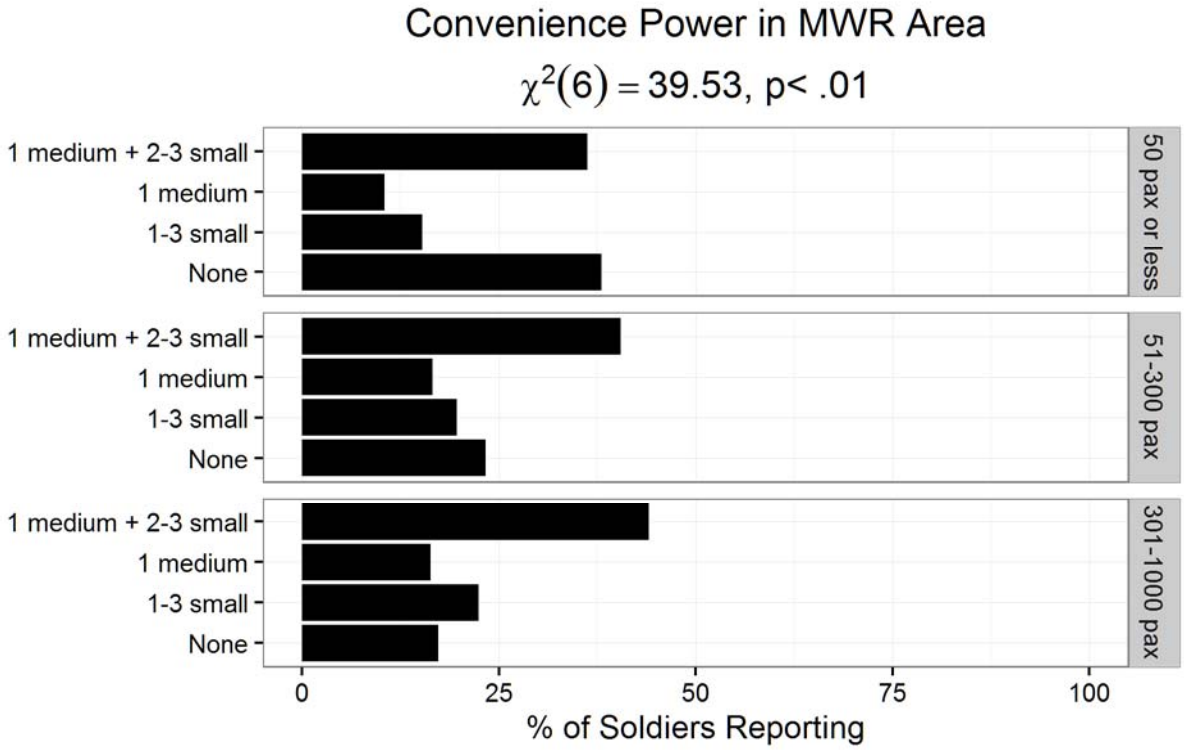

Access to Weights
$\chi^2(6) = 123.48, p < .01$
Machines
Dumbells/Barbells
Dumbells
None
50 pax or less
51-300 pax
301-1000 pax
0
25
50
75
100
% of Soldiers Reporting

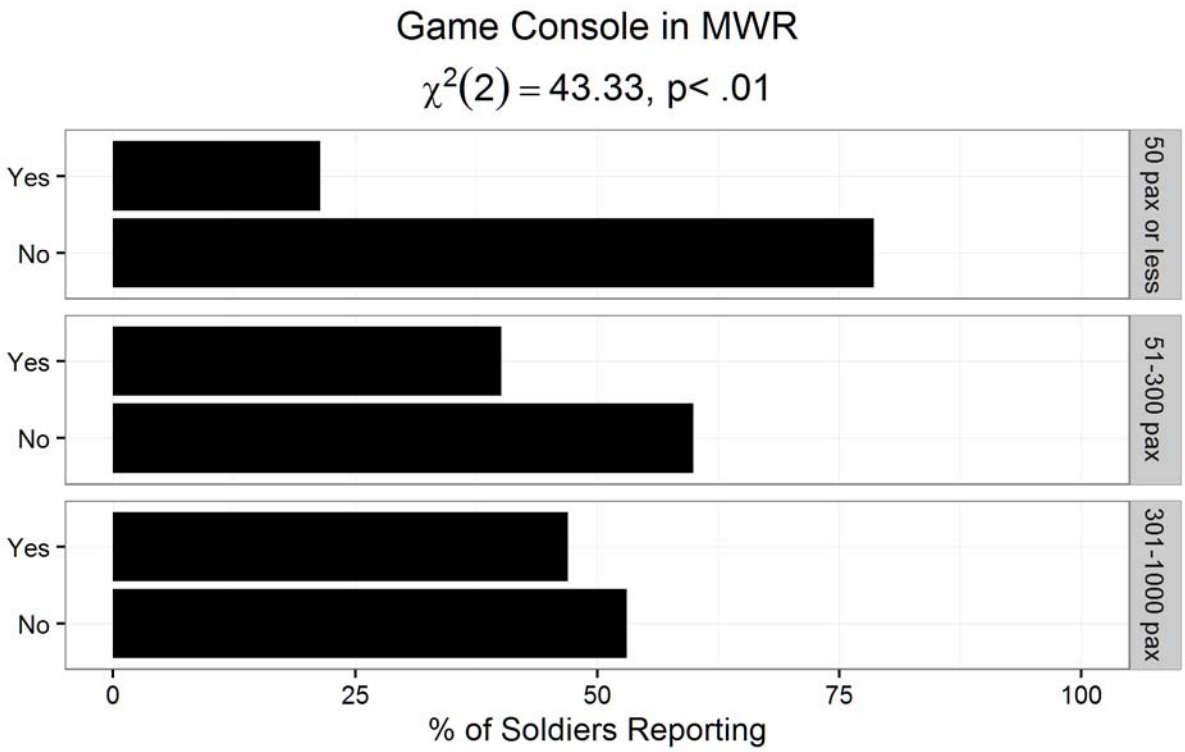

Equipment for Group Sports
$\chi^2(2) = 91.08, p < .01$
Yes
No
50 pax or less
51-300 pax
301-1000 pax
0
25
50
75
100
% of Soldiers Reporting

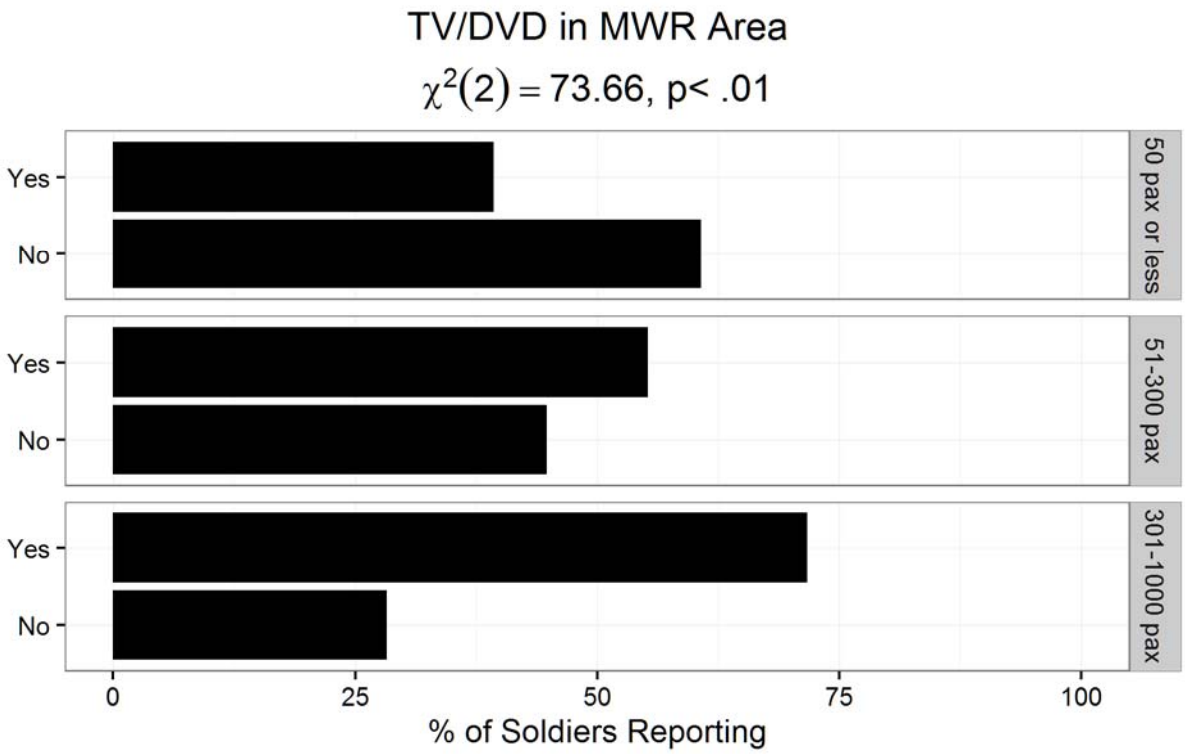

MWR Area
$\chi^2(4) = 101.05, p < .01$
None
Shelter w/out HVAC
Shelter w/ HVAC
50 pax or less
51-300 pax
301-1000 pax
0
25
50
75
100
% of Soldiers Reporting

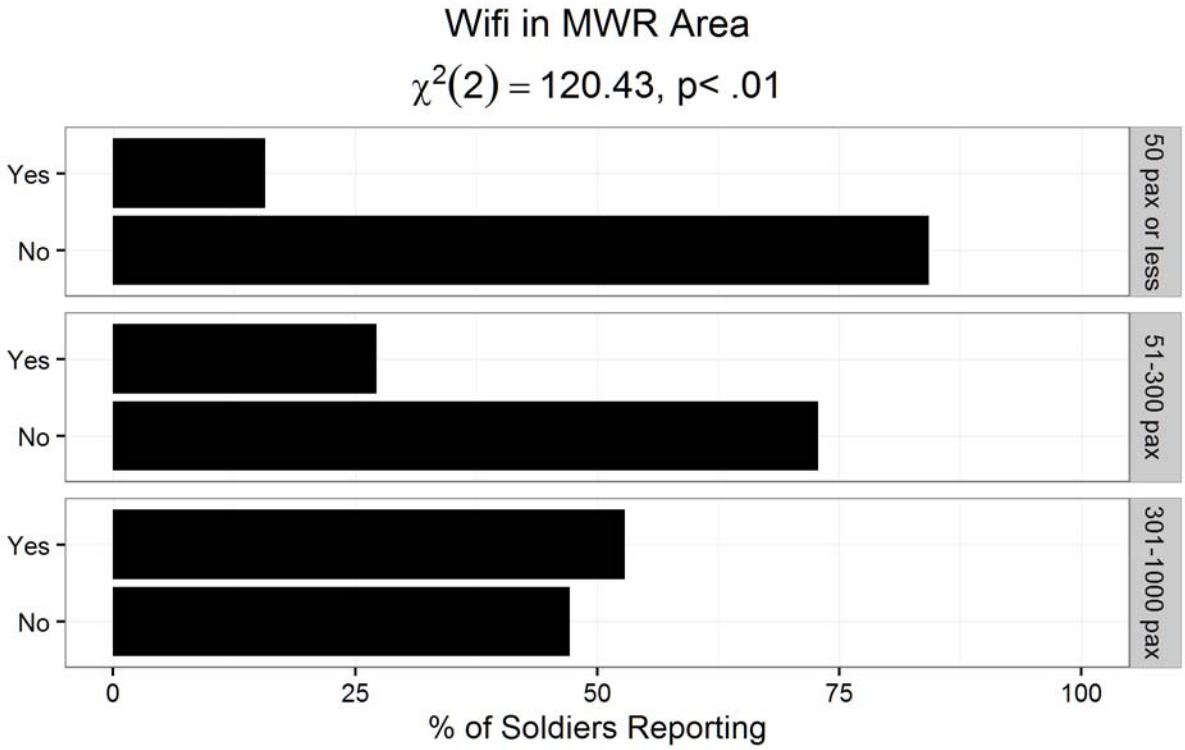

MWR Ventilation
$\chi^2(6) = 98.46, p < .01$
Windows and fans w/ AF
Windows and fans
Windows
Doors opening/closing
50 pax or less
51-300 pax
301-1000 pax
0
25
50
75
100
% of Soldiers Reporting

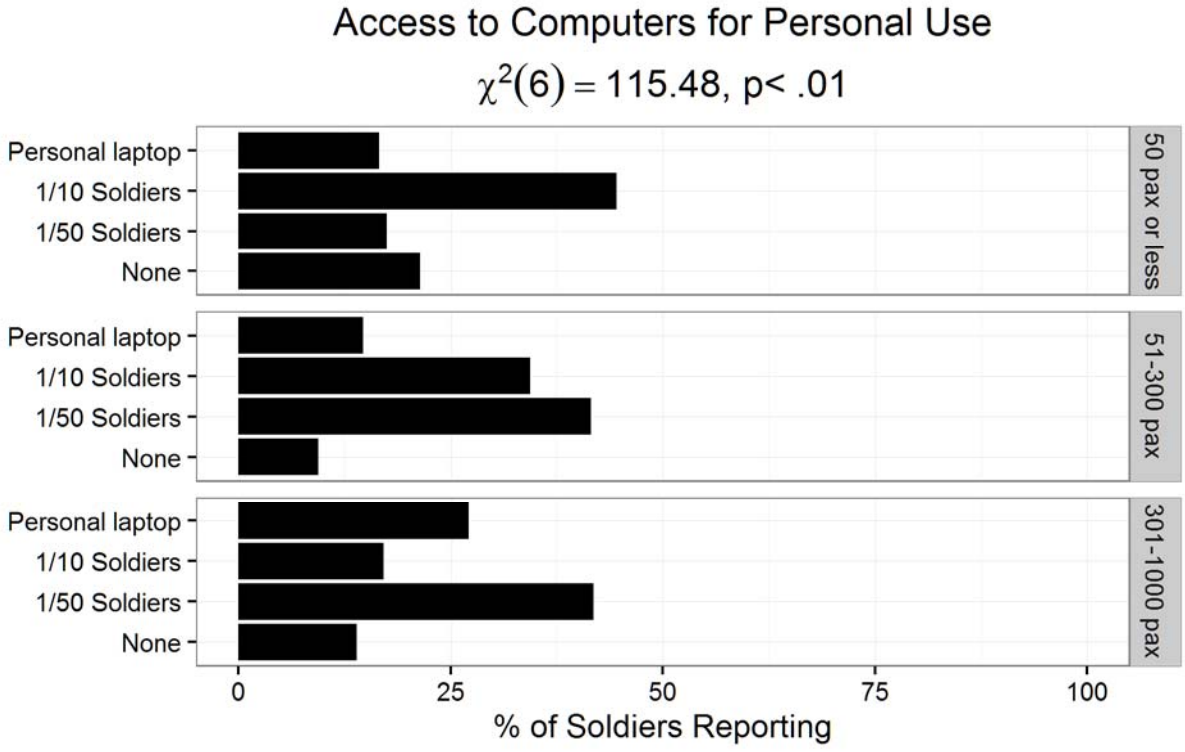

Temperature in MWR Area
$\chi^2(8) = 89.91, p < .01$
90 degrees
80 degrees
70 degrees
60 degrees
50 degrees
50 pax or less
51-300 pax
301-1000 pax
0
25
50
75
100
% of Soldiers Reporting

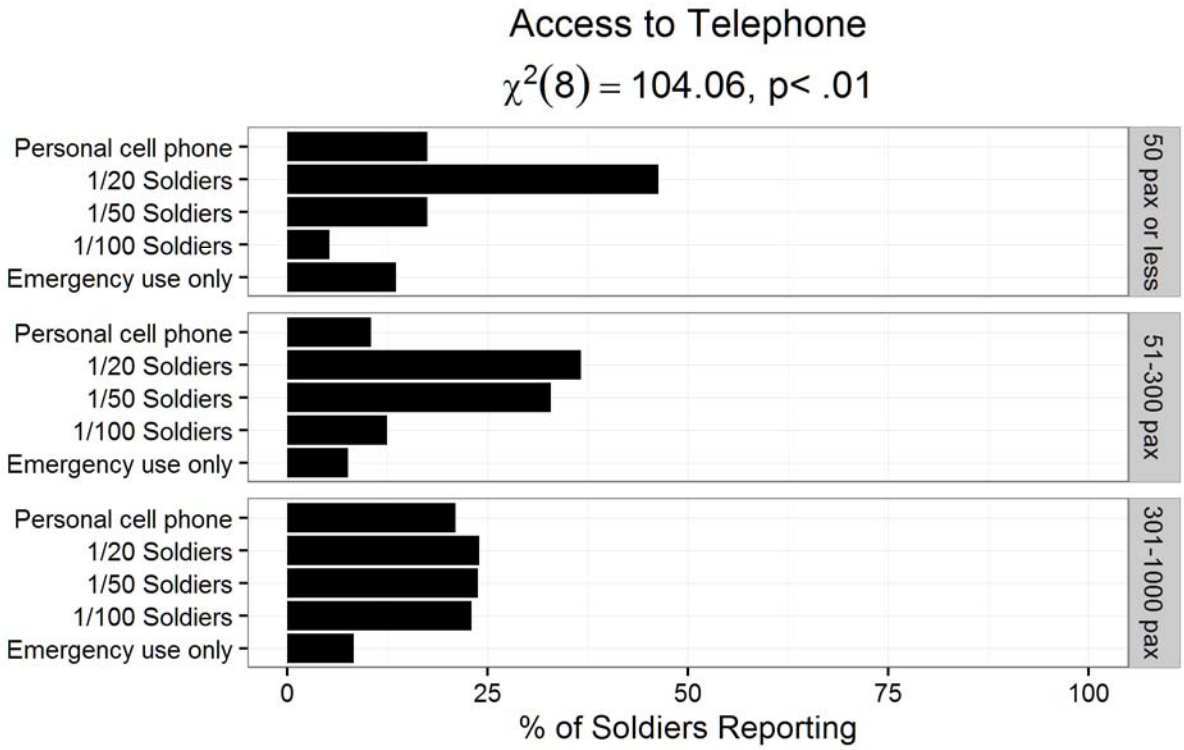

Convenience Power in MWR Area
$\chi^2(6) = 39.53, p < .01$
1 medium + 2-3 small
1 medium
1-3 small
None
50 pax or less
51-300 pax
301-1000 pax
0
25
50
75
100
% of Soldiers Reporting

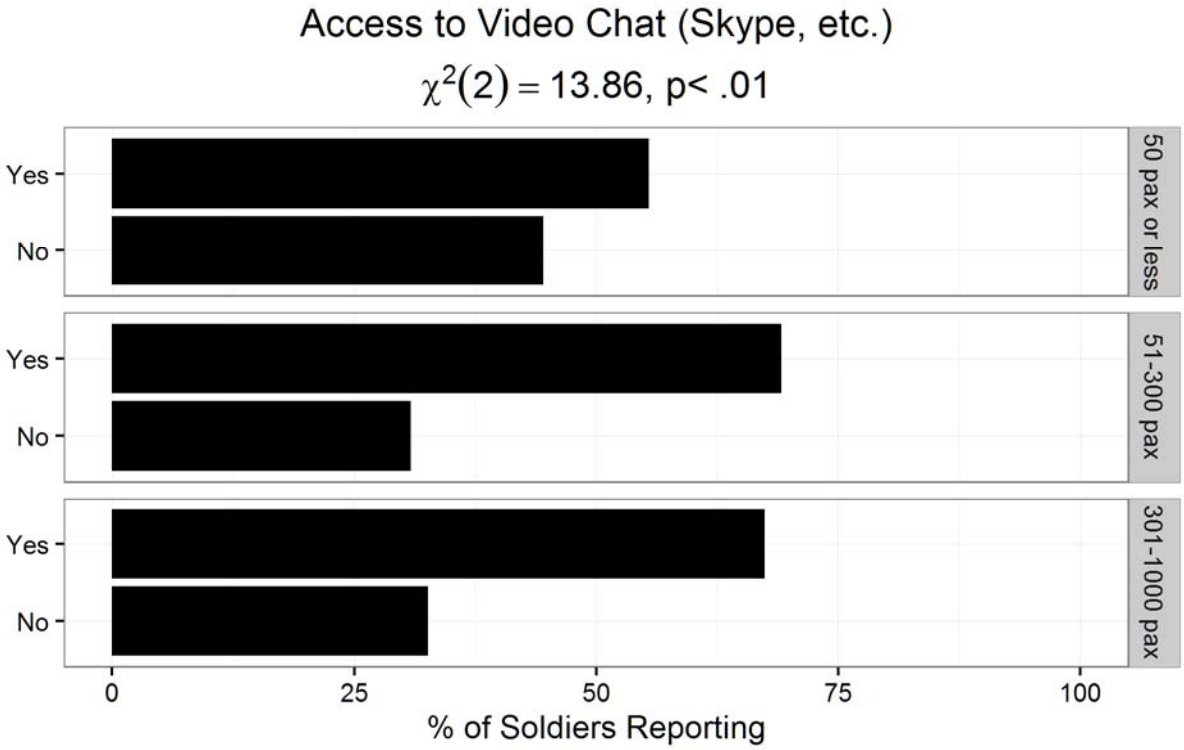

Game Console in MWR
$\chi^2(2) = 43.33$, p< .01
Yes
No
50 pax or less
Yes
No
51-300 pax
Yes
No
301-1000 pax
0
25
50
75
100
% of Soldiers Reporting

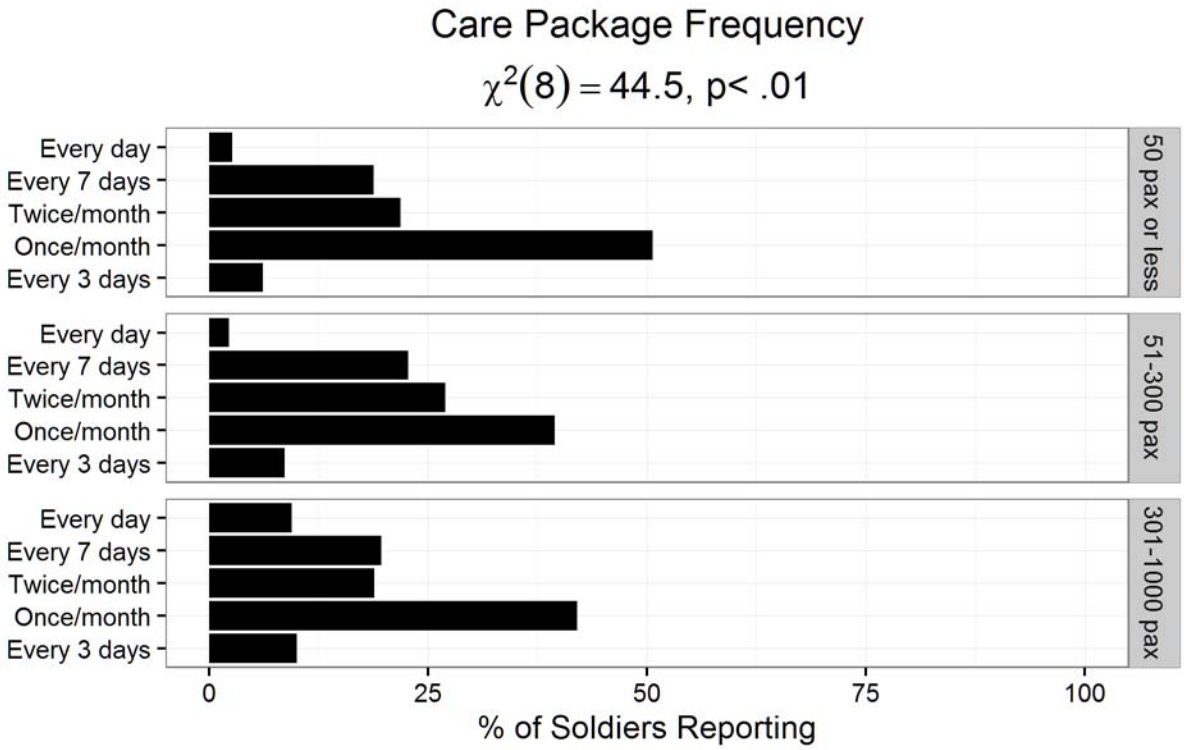

TV/DVD in MWR Area
$\chi^2(2) = 73.66$, p< .01
Yes
No
50 pax or less
Yes
No
51-300 pax
Yes
No
301-1000 pax
0
25
50
75
100
% of Soldiers Reporting

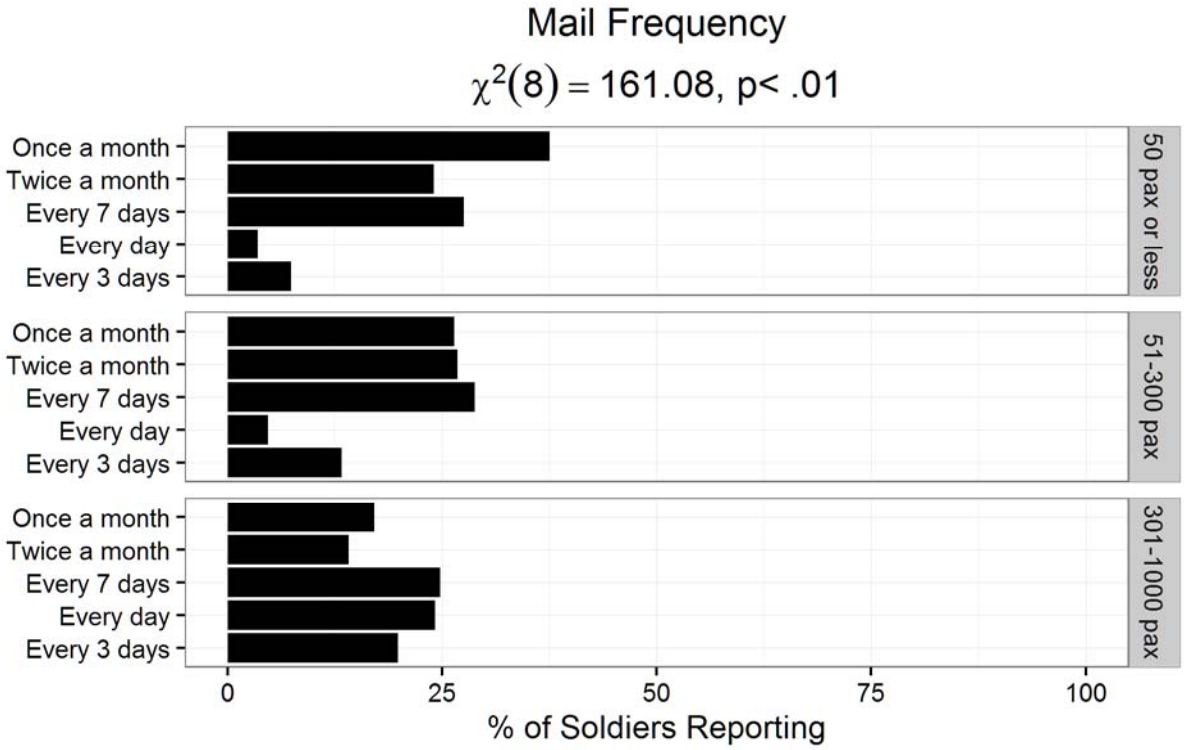

Wifi in MWR Area
$\chi^2(2) = 120.43$, p< .01
Yes
No
50 pax or less
Yes
No
51-300 pax
Yes
No
301-1000 pax
0
25
50
75
100
% of Soldiers Reporting

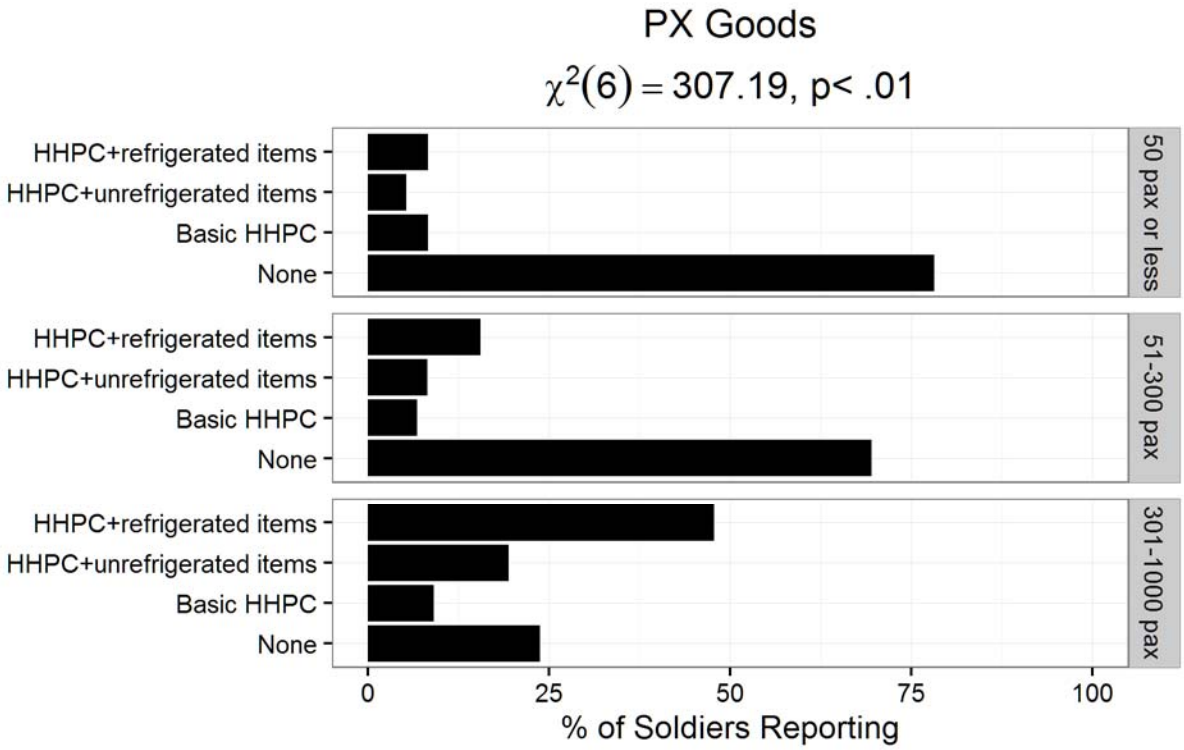

Access to Computers for Personal Use
$\chi^2(6) = 115.48$, p< .01
Personal laptop
1/10 Soldiers
1/50 Soldiers
None
50 pax or less
Personal laptop
1/10 Soldiers
1/50 Soldiers
None
51-300 pax
Personal laptop
1/10 Soldiers
1/50 Soldiers
None
301-1000 pax
0
25
50
75
100
% of Soldiers Reporting

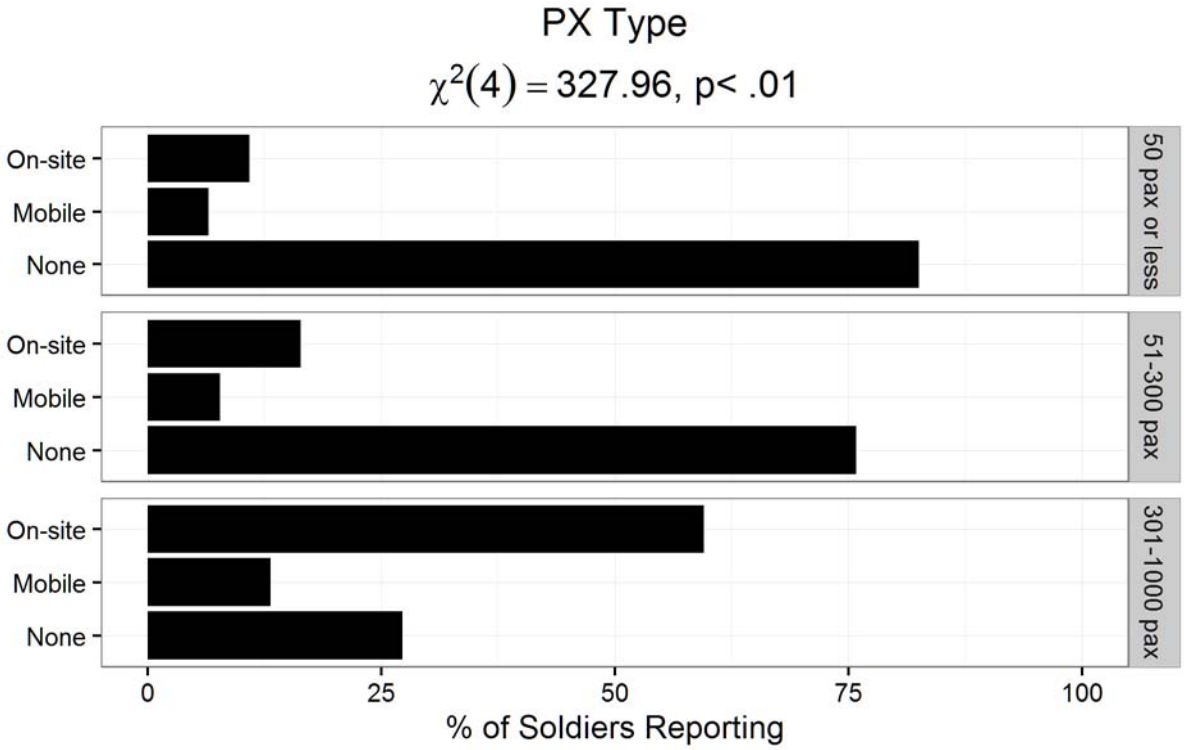

Access to Telephone
$\chi^2(8) = 104.06, p < .01$
Personal cell phone
1/20 Soldiers
1/50 Soldiers
1/100 Soldiers
Emergency use only
50 pax or less
51-300 pax
301-1000 pax
0
25
50
75
100
% of Soldiers Reporting

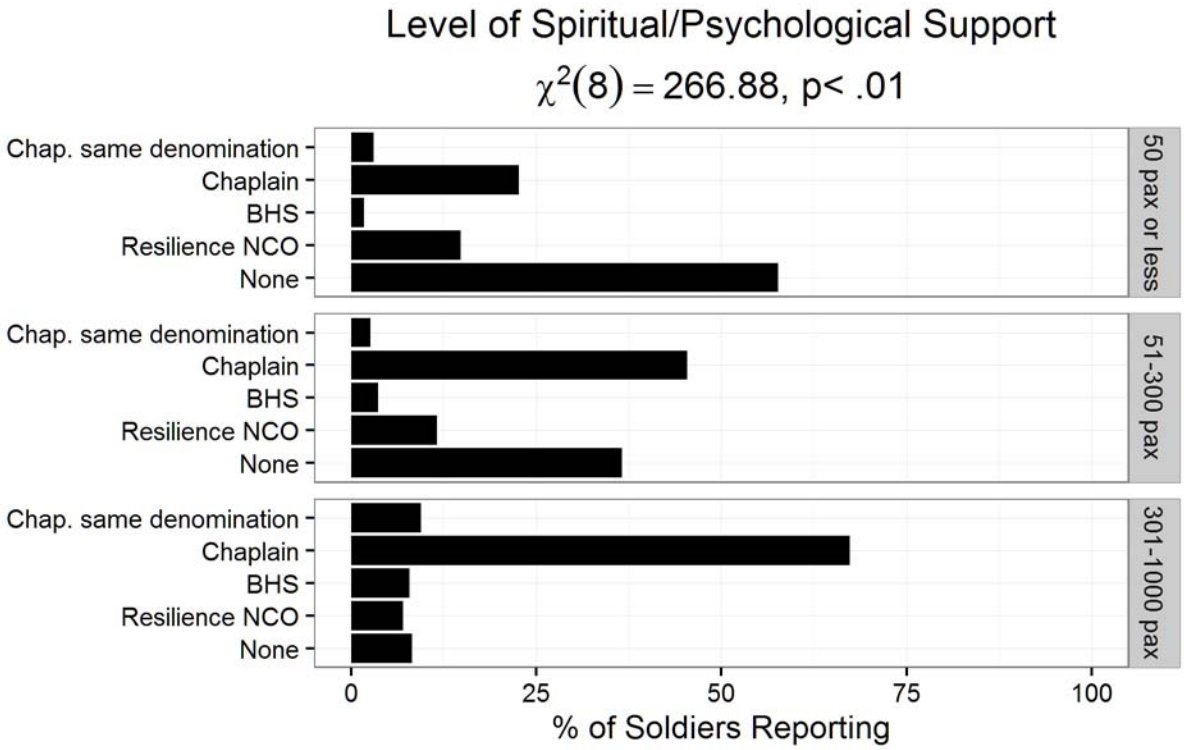

Access to Video Chat (Skype, etc.)
$\chi^2(2) = 13.86, p < .01$
Yes
No
50 pax or less
51-300 pax
301-1000 pax
0
25
50
75
100
% of Soldiers Reporting

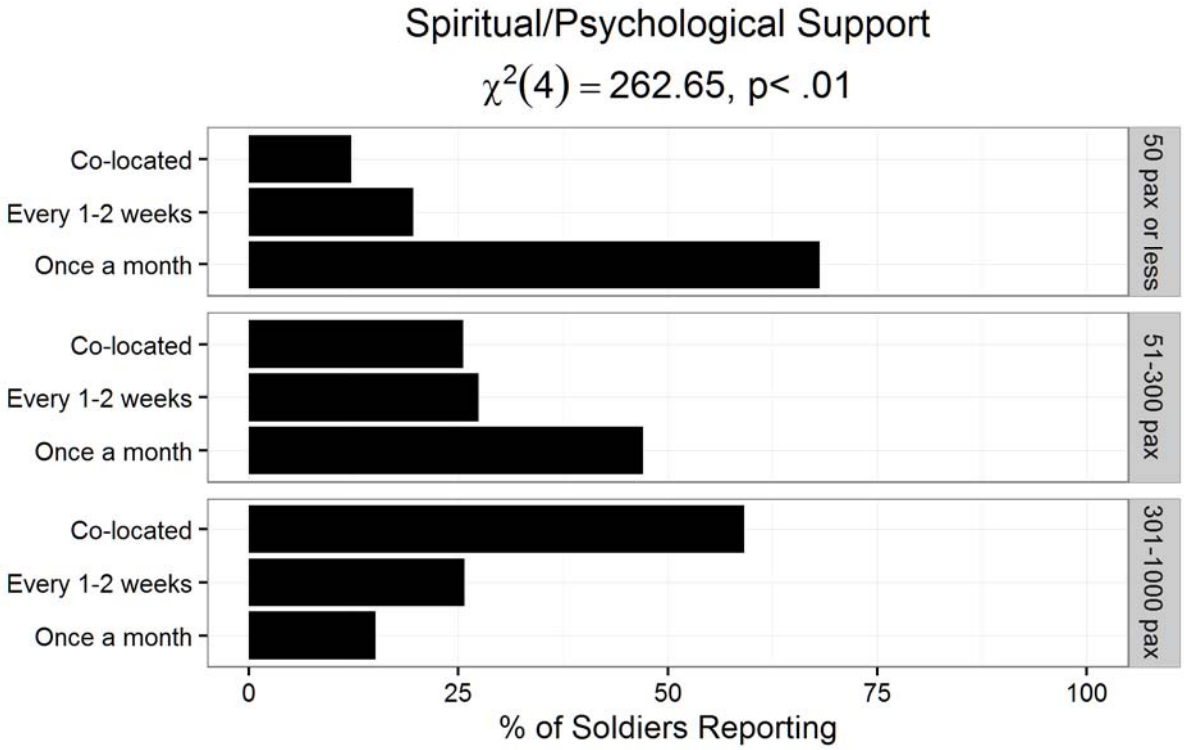

Care Package Frequency
$\chi^2(8) = 44.5, p < .01$
Every day
Every 7 days
Twice/month
Once/month
Every 3 days
50 pax or less
51-300 pax
301-1000 pax
0
25
50
75
100
% of Soldiers Reporting

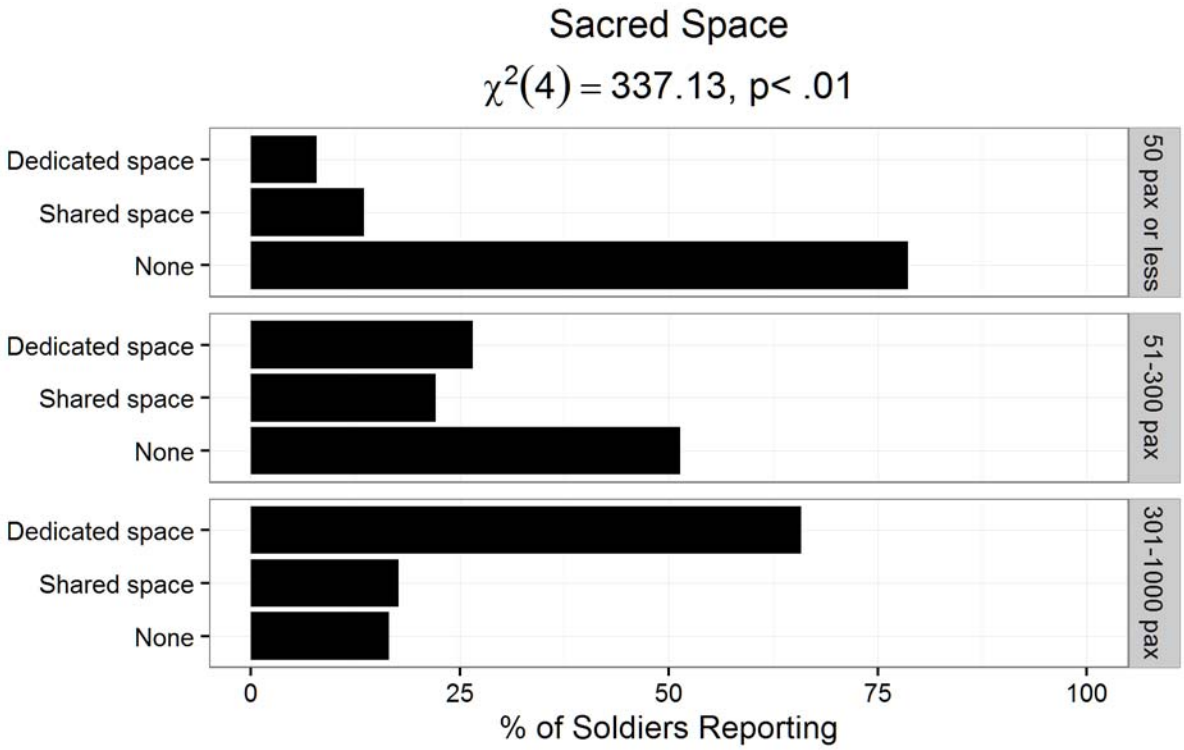

Mail Frequency
$\chi^2(8) = 161.08, p < .01$
Once a month
Twice a month
Every 7 days
Every day
Every 3 days
50 pax or less
51-300 pax
301-1000 pax
0
25
50
75
100
% of Soldiers Reporting

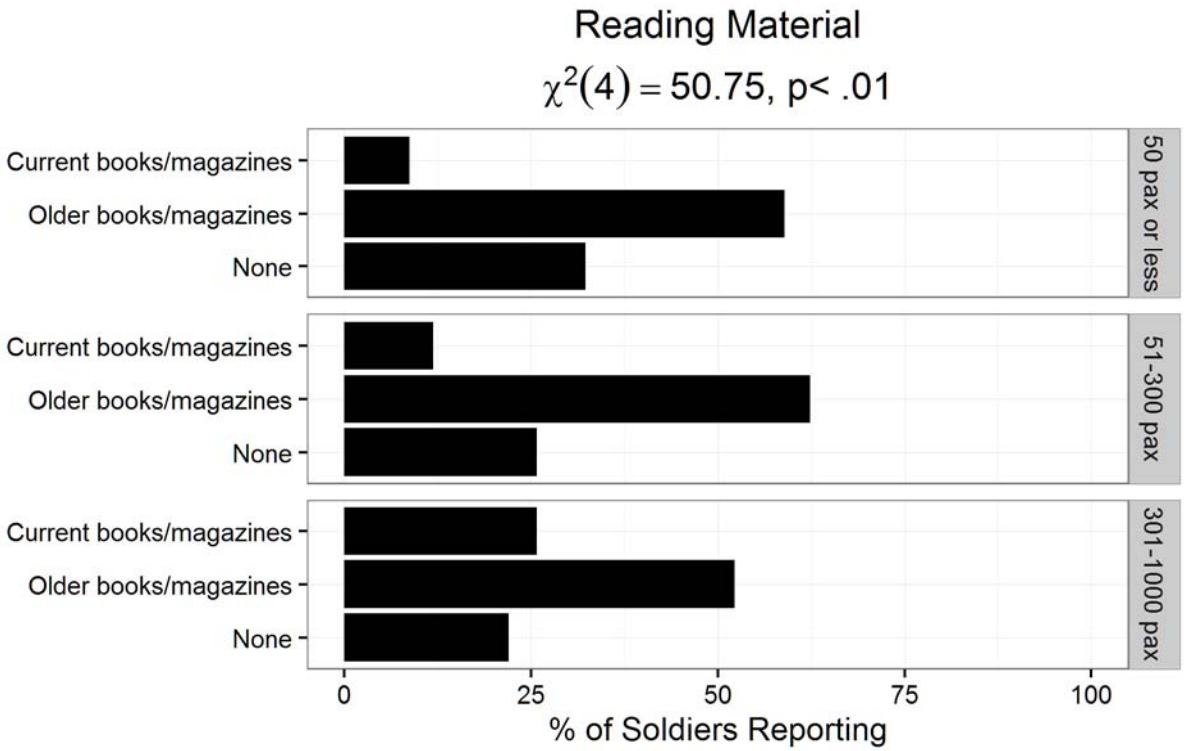

PX Goods
$\chi^2(6) = 307.19, p < .01$
HHPC+refrigerated items
HHPC+unrefrigerated items
Basic HHPC
None
50 pax or less
51-300 pax
301-1000 pax
0
25
50
75
100
% of Soldiers Reporting

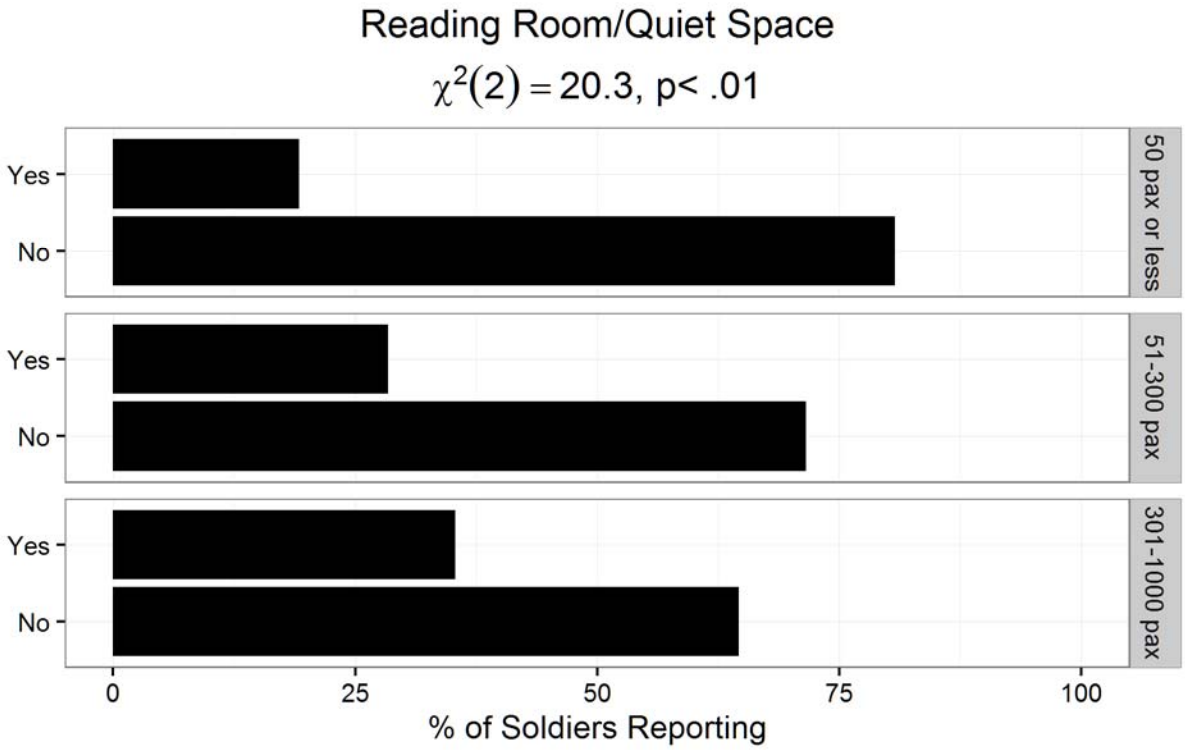

PX Type
$\chi^2(4) = 327.96, p < .01$
On-site
Mobile
None
50 pax or less
51-300 pax
301-1000 pax
0
25
50
75
100
% of Soldiers Reporting

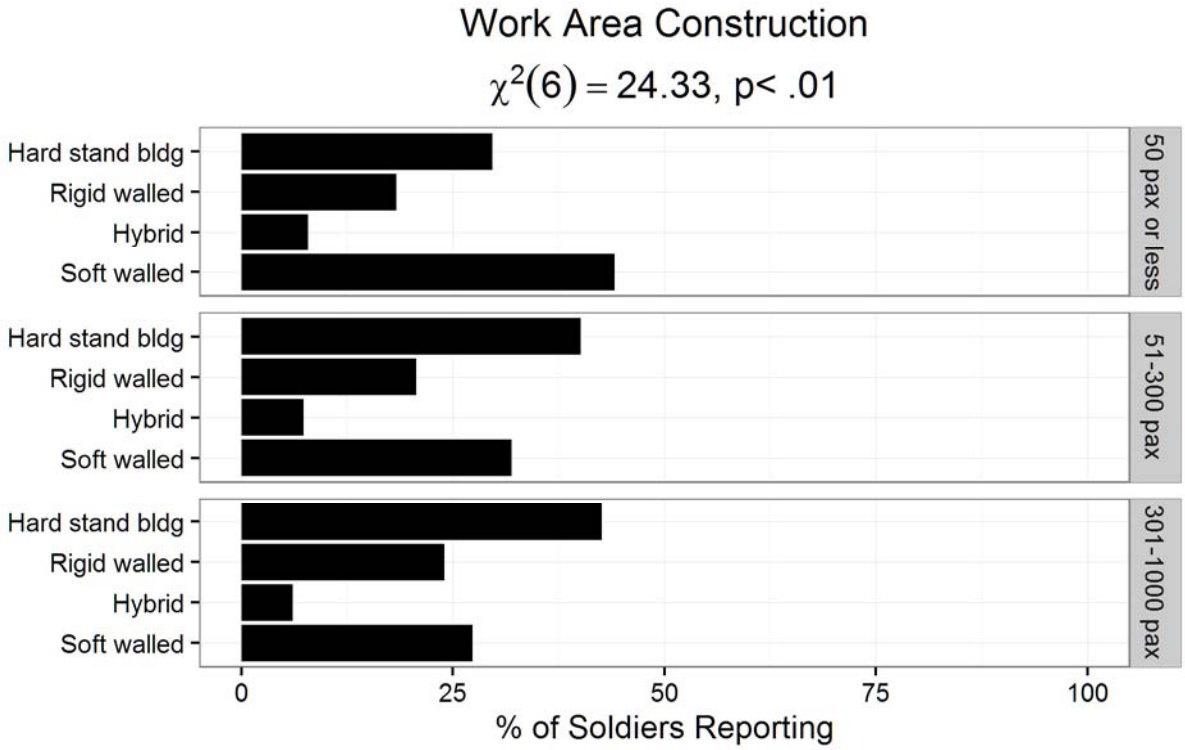

Level of Spiritual/Psychological Support
$\chi^2(8) = 266.88$, p< .01
Chap. same denomination
Chaplain
BHS
Resilience NCO
None
50 pax or less
51-300 pax
301-1000 pax
0
25
50
75
100
% of Soldiers Reporting

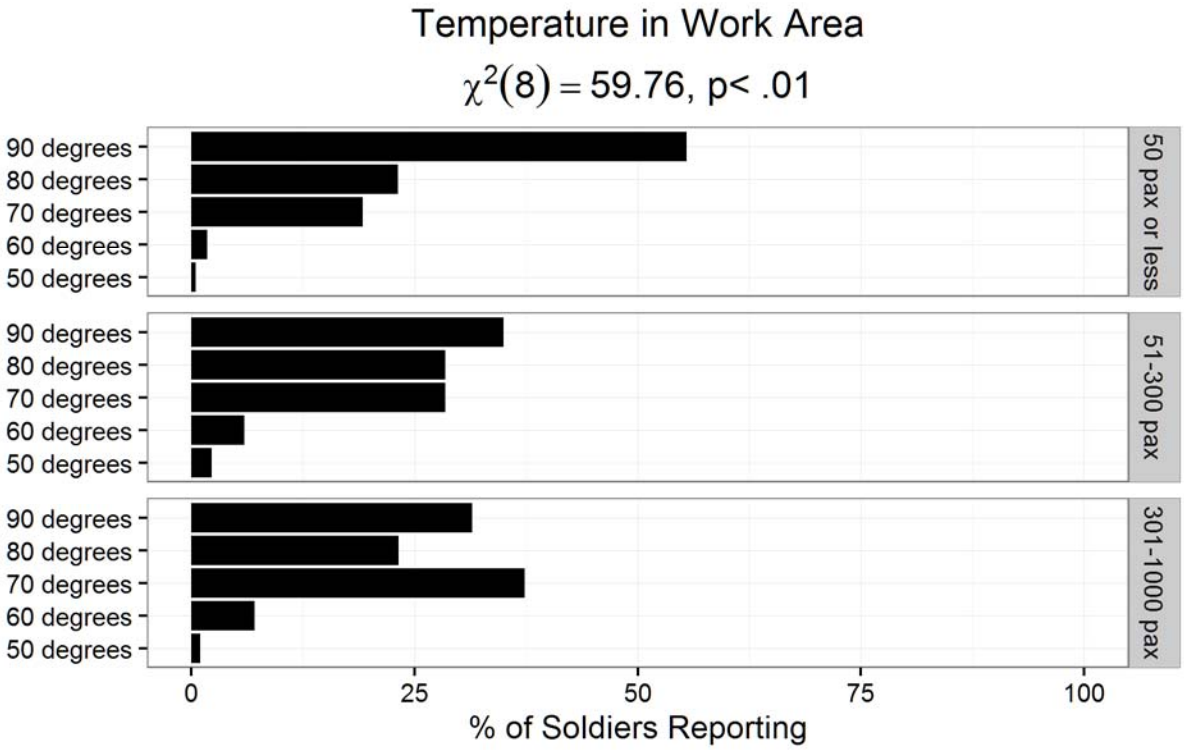

Spiritual/Psychological Support
$\chi^2(4) = 262.65$, p< .01
Co-located
Every 1-2 weeks
Once a month
50 pax or less
51-300 pax
301-1000 pax
0
25
50
75
100
% of Soldiers Reporting

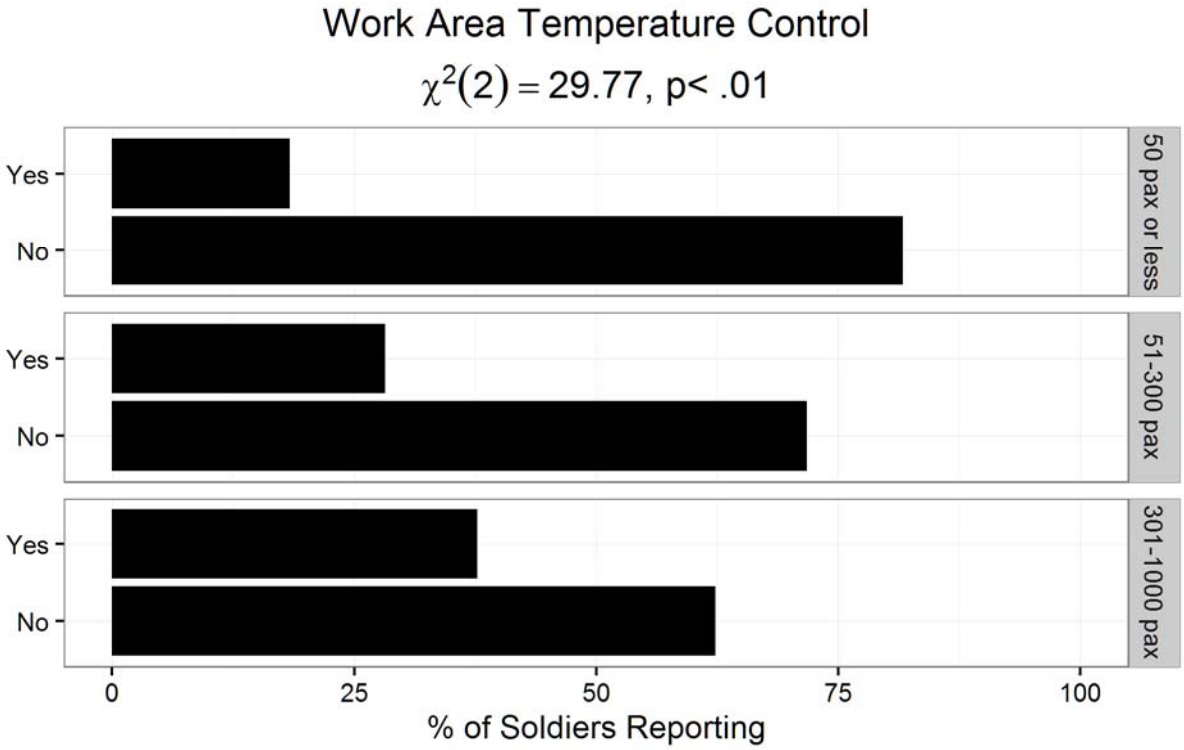

Sacred Space
$\chi^2(4) = 337.13, p < .01$
Dedicated space
Shared space
None
50 pax or less
51-300 pax
301-1000 pax
0
25
50
75
100
% of Soldiers Reporting

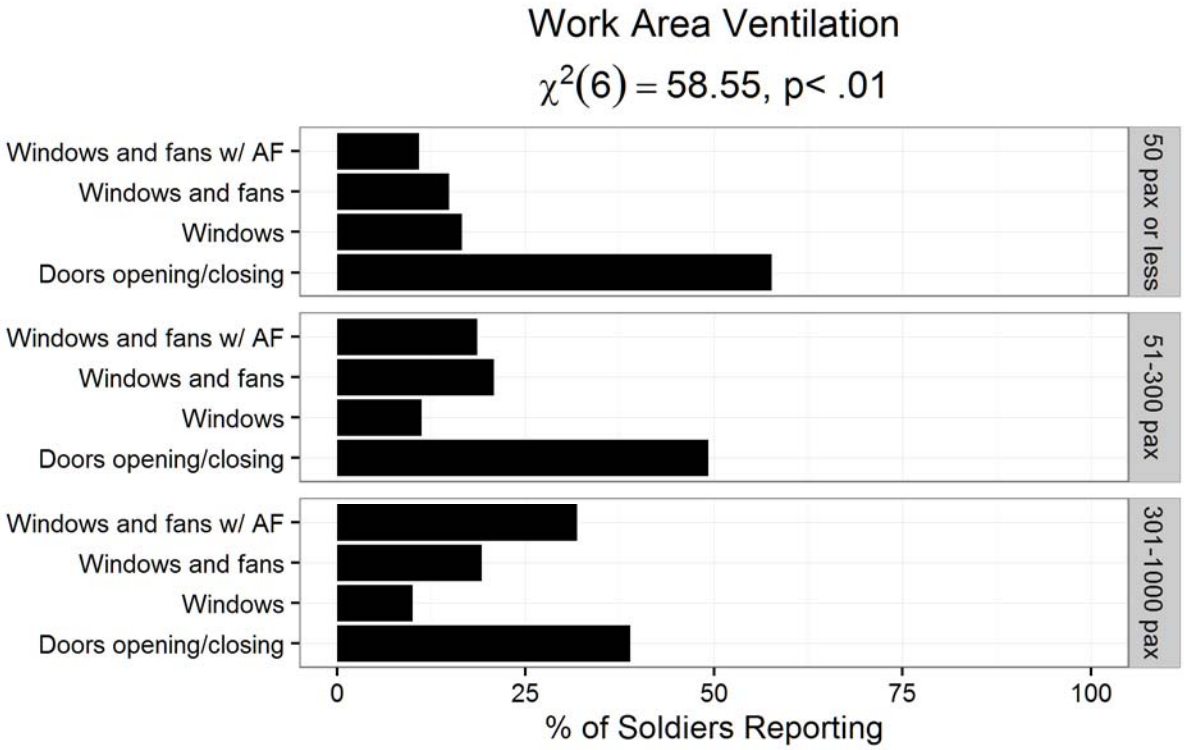

Reading Material
$\chi^2(4) = 50.75, p < .01$
Current books/magazines
Older books/magazines
None
50 pax or less
51-300 pax
301-1000 pax
0
25
50
75
100
% of Soldiers Reporting

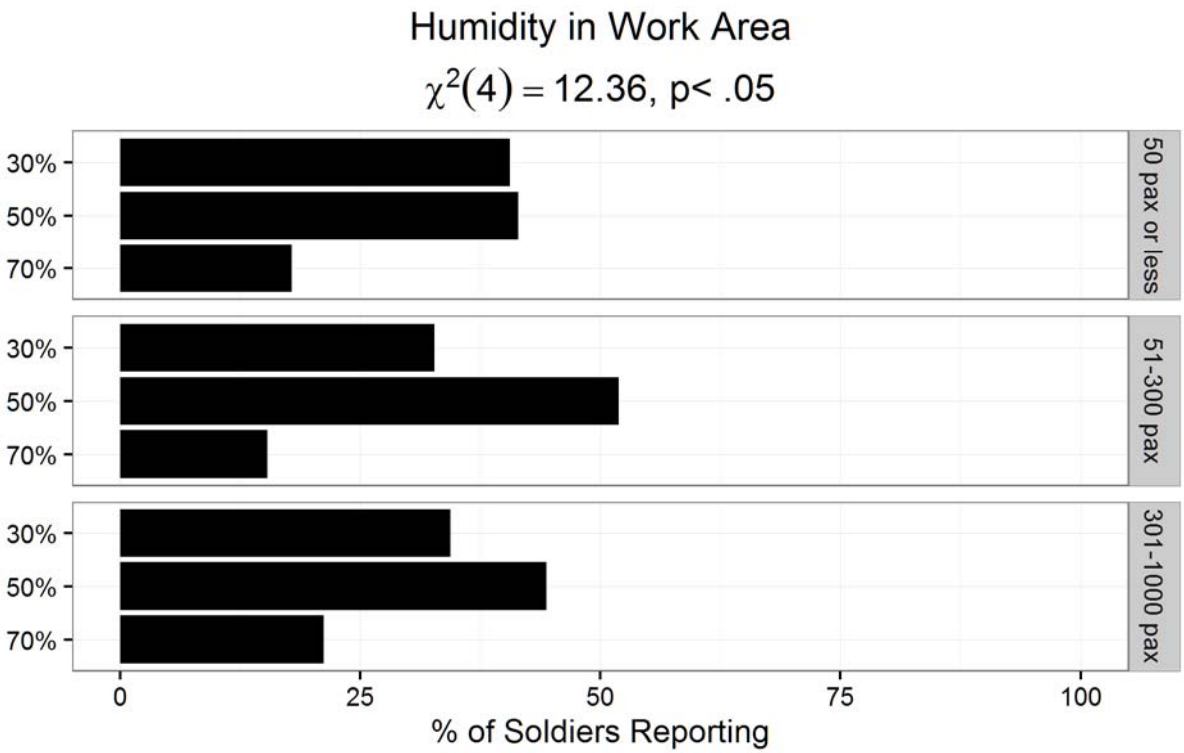

Reading Room/Quiet Space
$\chi^2(2) = 20.3, p < .01$
Yes
No
50 pax or less
Yes
No
51-300 pax
Yes
No
301-1000 pax
0
25
50
75
100
% of Soldiers Reporting

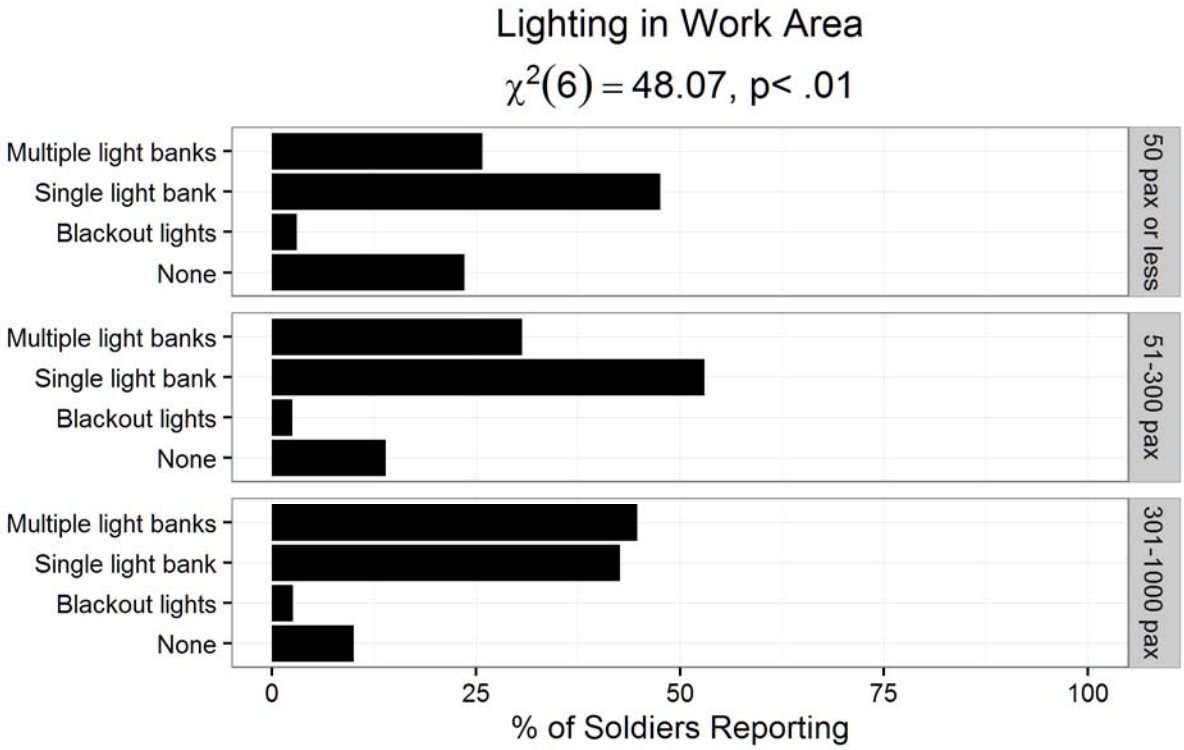

Work Area Construction
$\chi^2(6) = 24.33, p < .01$
Hard stand bldg
Rigid walled
Hybrid
Soft walled
50 pax or less
Hard stand bldg
Rigid walled
Hybrid
Soft walled
51-300 pax
Hard stand bldg
Rigid walled
Hybrid
Soft walled
301-1000 pax
0
25
50
75
100
% of Soldiers Reporting

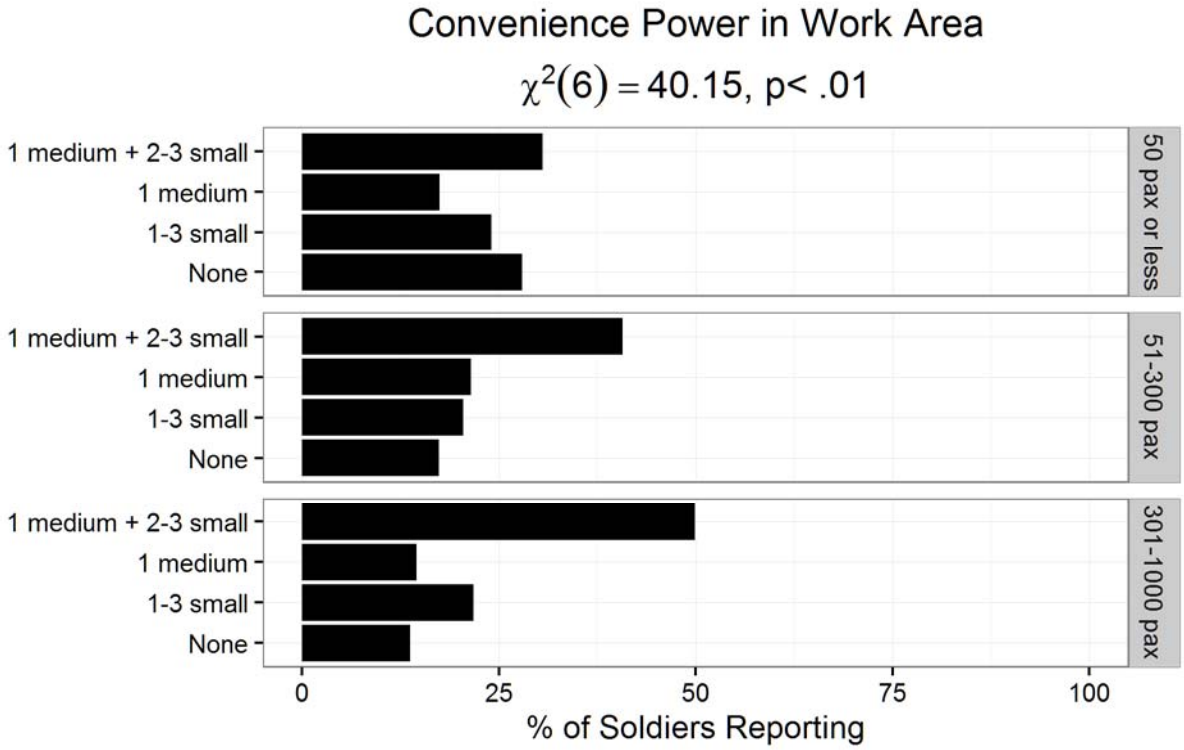

Temperature in Work Area
$\chi^2(8) = 59.76$, p< .01
90 degrees
80 degrees
70 degrees
60 degrees
50 degrees
50 pax or less
51-300 pax
301-1000 pax
0
25
50
75
100
% of Soldiers Reporting

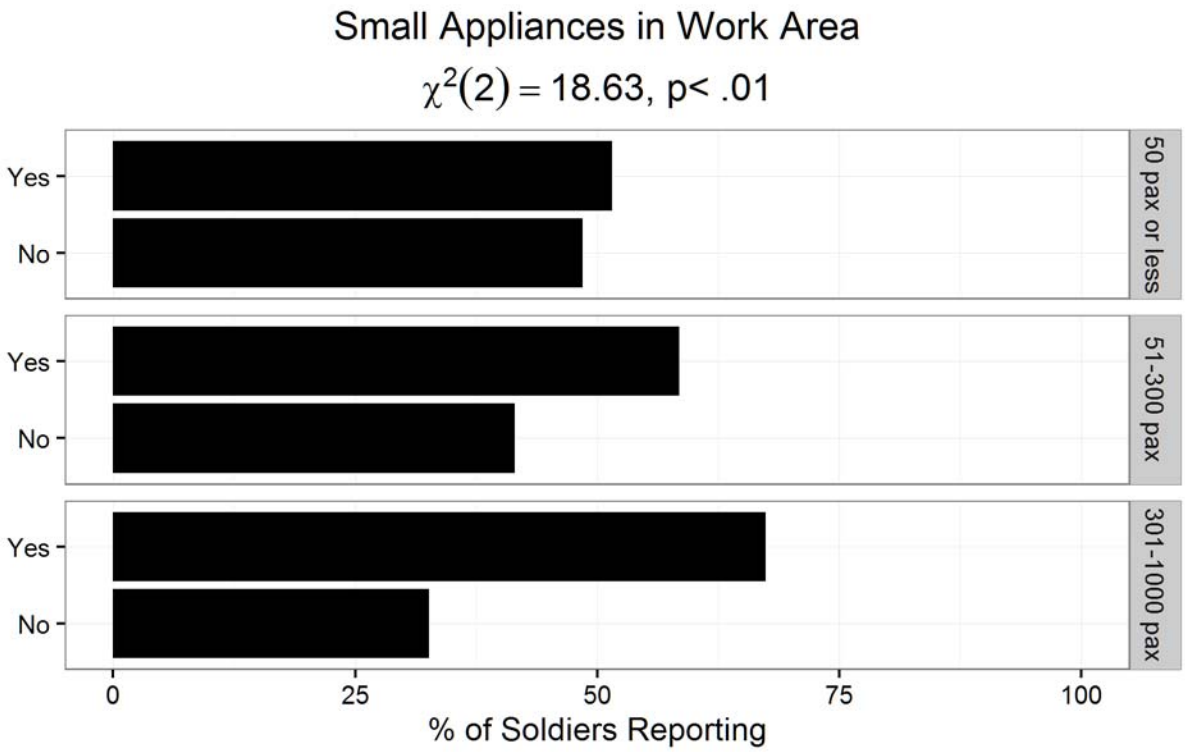

Work Area Temperature Control
$\chi^2(2) = 29.77$, p< .01
Yes
No
50 pax or less
51-300 pax
301-1000 pax
0
25
50
75
100
% of Soldiers Reporting

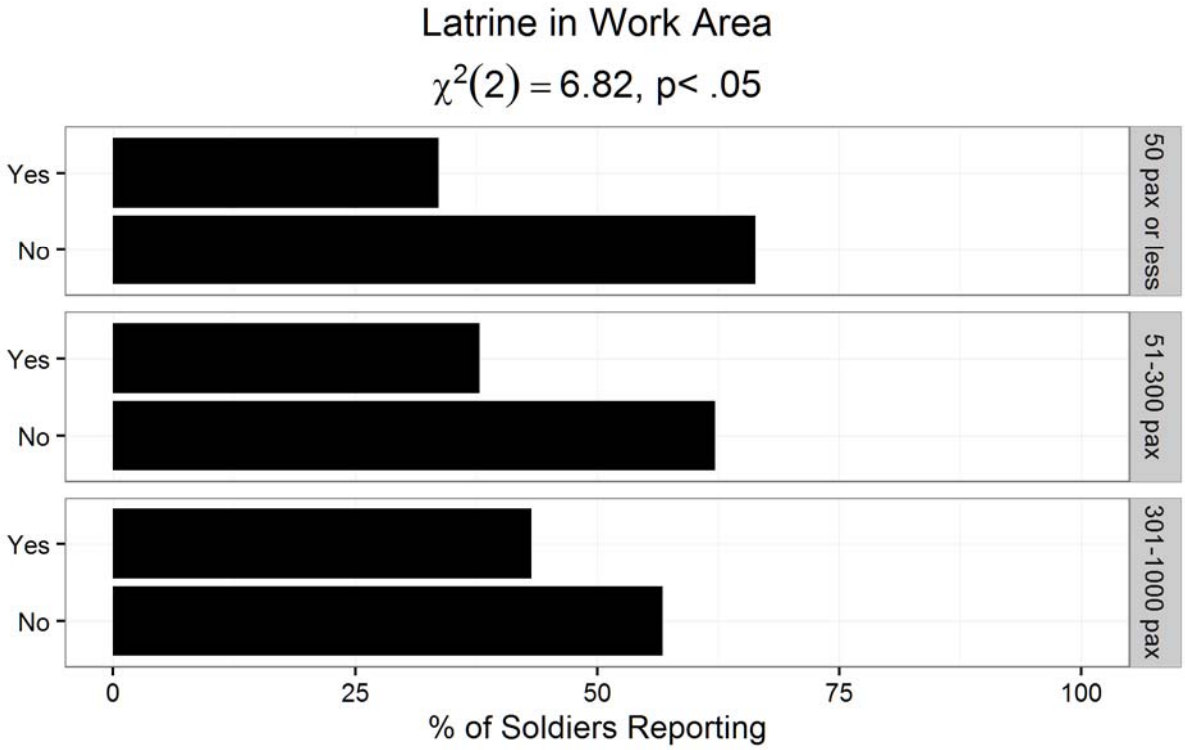

Work Area Ventilation
$\chi^2(6) = 58.55, p < .01$
Windows and fans w/ AF
Windows and fans
Windows
Doors opening/closing
50 pax or less
51-300 pax
301-1000 pax
0
25
50
75
100
% of Soldiers Reporting

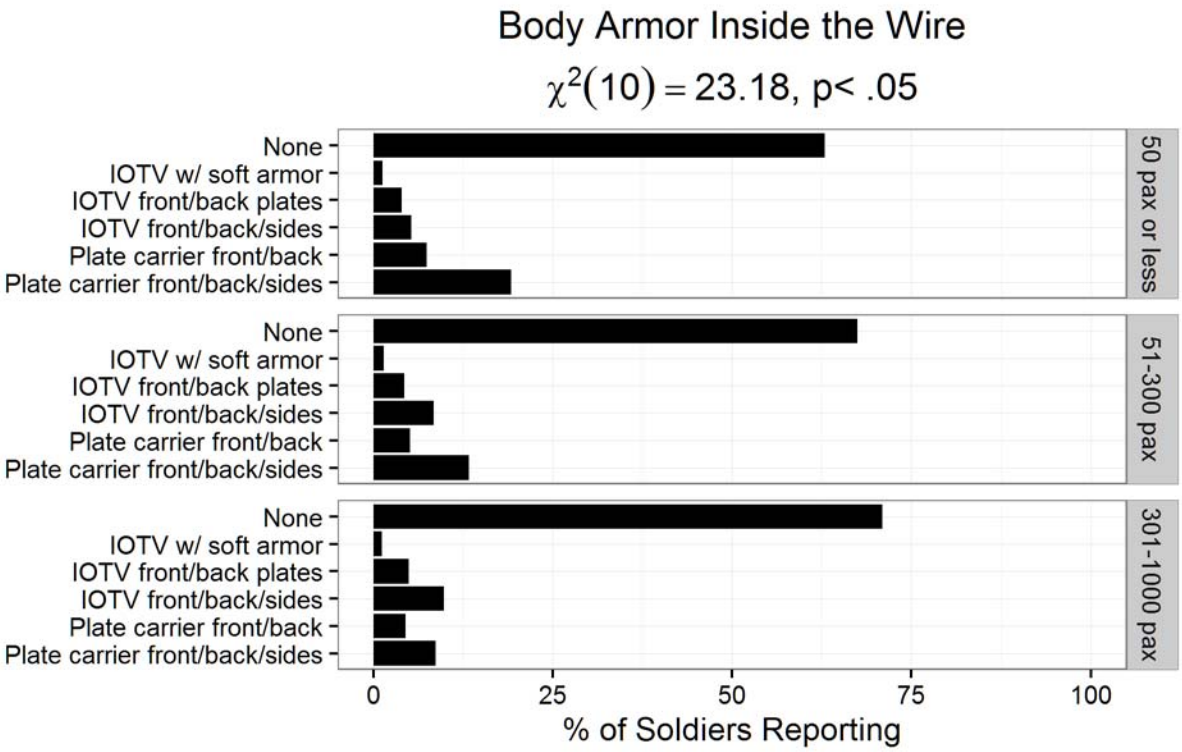

Humidity in Work Area
$\chi^2(4) = 12.36, p < .05$
30%
50%
70%
50 pax or less
51-300 pax
301-1000 pax
0
25
50
75
100
% of Soldiers Reporting


Lighting in Work Area
$\chi^2(6) = 48.07, p < .01$
Multiple light banks
Single light bank
Blackout lights
None
50 pax or less
51-300 pax
301-1000 pax
0
25
50
75
100
% of Soldiers Reporting


Convenience Power in Work Area
$\chi^2(6) = 40.15, p < .01$
1 medium + 2-3 small
1 medium
1-3 small
None
50 pax or less
51-300 pax
301-1000 pax
0
25
50
75
100
% of Soldiers Reporting


Small Appliances in Work Area
$\chi^2(2) = 18.63$, p< .01
Yes
No
50 pax or less
Yes
No
51-300 pax
Yes
No
301-1000 pax
0
25
50
75
100
% of Soldiers Reporting


Latrine in Work Area
$\chi^2(2) = 6.82$, p< .05
Yes
No
50 pax or less
Yes
No
51-300 pax
Yes
No
301-1000 pax
0
25
50
75
100
% of Soldiers Reporting


Body Armor Inside the Wire
$\chi^2(10) = 23.18, p < .05$
None
IOTV w/ soft armor
IOTV front/back plates
IOTV front/back/sides
Plate carrier front/back
Plate carrier front/back/sides
50 pax or less
51-300 pax
301-1000 pax
0
25
50
75
100
% of Soldiers Reporting

This page intentionally left blank

Appendix B: Aggregate QoL Model

B.1 Model Quality

Assessment of model quality focused on three issues:

1) Did the Markov Chains for the predictors converge on stable posterior estimates of sample-level coefficients?
2) Assuming the coefficients converged, how many iterations of the sampler were required to "burn in" the posterior distribution and reach convergence?
3) Did the resulting model adequately fit the observed data?

Various statistical techniques have been proposed for evaluating whether a posterior Markov Chain has converged. Each technique has known limitations, and current best practice is to use more than one diagnostic test to determine if a chain has converged (Cowles & Carlin, 1996). Therefore, two widely used diagnostics were applied to evaluate convergence for each posterior delta: the method of Heidelberger and Welch (Heidelberger & Welch, 1981) and the method proposed by Geweke (1992). These diagnostics were run on the Markov Chain iterations for each attribute level included in the hierarchical model. For each chain, the first 1000 iterations (10% of the total) were treated as burn-in for the Gibbs sampler. The remaining iterations were considered to have converged if at least one of the two diagnostics passed. Using this decision criterion, all but one attribute level demonstrated convergence. The one exception was the second level of the Bed Type attribute (sleeping on one cot of bunked cots). However, this level also converged once the number of burn-in iterations was increased to 8000 (30% of the total). Overall, these are very good convergence results for a model estimating this number of parameters from a partial profile discrete choice task.

In addition to statistical convergence diagnostics, the posterior chains for each attribute level were inspected visually to corroborate the diagnostic results. Each chain was inspected in four ways:

1) Through a kernel density plot of the distribution of posterior deltas, with a normal distribution suggesting well-formed estimation.
2) Through a plot of the cumulative mean of the chain, with a stable asymptote suggesting convergence.
3) Through a trace of the deltas across iterations of the Markov Chain, with a flat trend suggesting convergence and random distribution about the mean suggesting proper mixing within the Gibbs sampler.
4) Through an autocorrelation analysis of the chain, with the absence of significant autocorrelations at higher lags suggesting proper mixing within the Gibbs sampler.

Figure B-1 provides an example of the graphical output described above for one randomly chosen chain (in this case, the *10 minutes or less* level of the *Shower Duration* attribute).

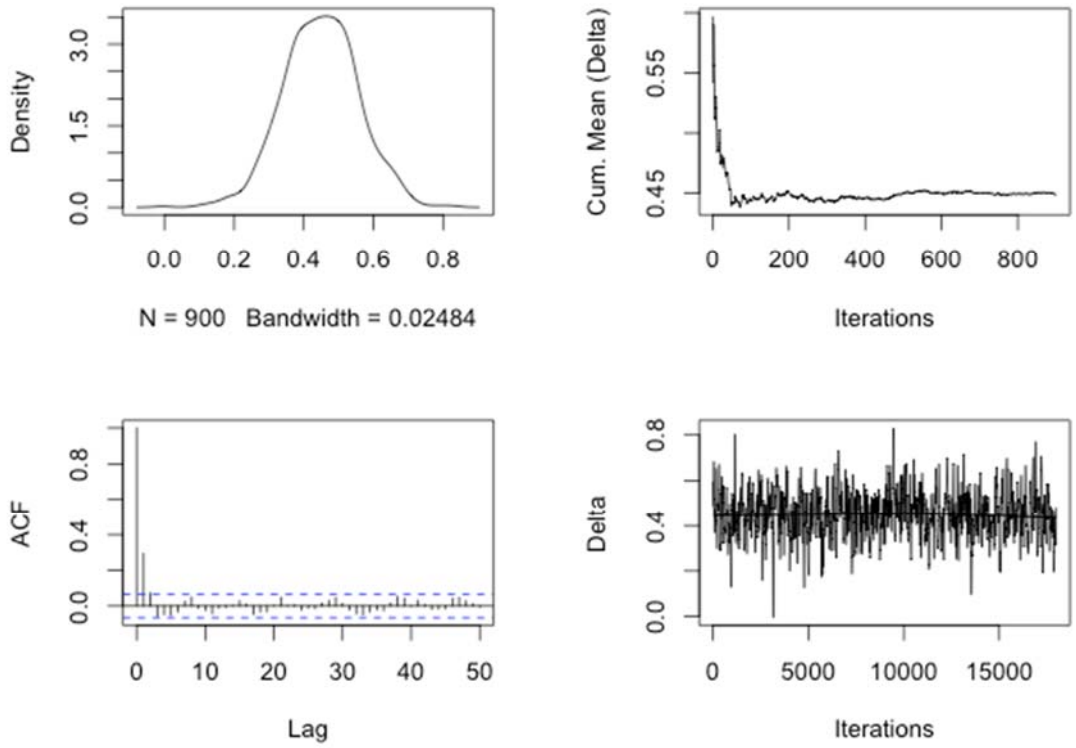


Figure B-1. Diagnostic plots from the aggregate model.

Having established that the aggregate coefficients were sound, the next question concerned the overall quality of the fit between observed choices made by the survey participants and predictions of the model. To assess fit, predictions were made for every trial for every participant by multiplying the mean delta for each attribute level by the difference in attribute levels presented during the survey. The resulting vector was summed to produce a predicted response for each trial. The correlation between the predicted and observed responses was statistically significant, $r = .50$, $p < .001$, with an adjusted r^2 of 0.25 and a root mean square error (RMSE) of 1.14. Residuals were normally distributed (Figure B-2) and centered on zero (Figure B-3), indicating there was no systematic bias in the model predictions.

Taken together, the results suggest that the aggregate model does reasonably well in predicting participant-level responses. While a r^2 of 0.25 might seem low, it is important to remember that in this hierarchical model the aggregate level ignores heterogeneity amongst participants in attribute preferences. Given the variety of experience found amongst the Soldiers who completed this survey, it is not surprising that the aggregate fit was lower than the fit of the individual-level model discussed in the body of this report. Nevertheless, the aggregate results do shed light on the overall utility that the basecamp attributes have in determining quality of life (QoL).

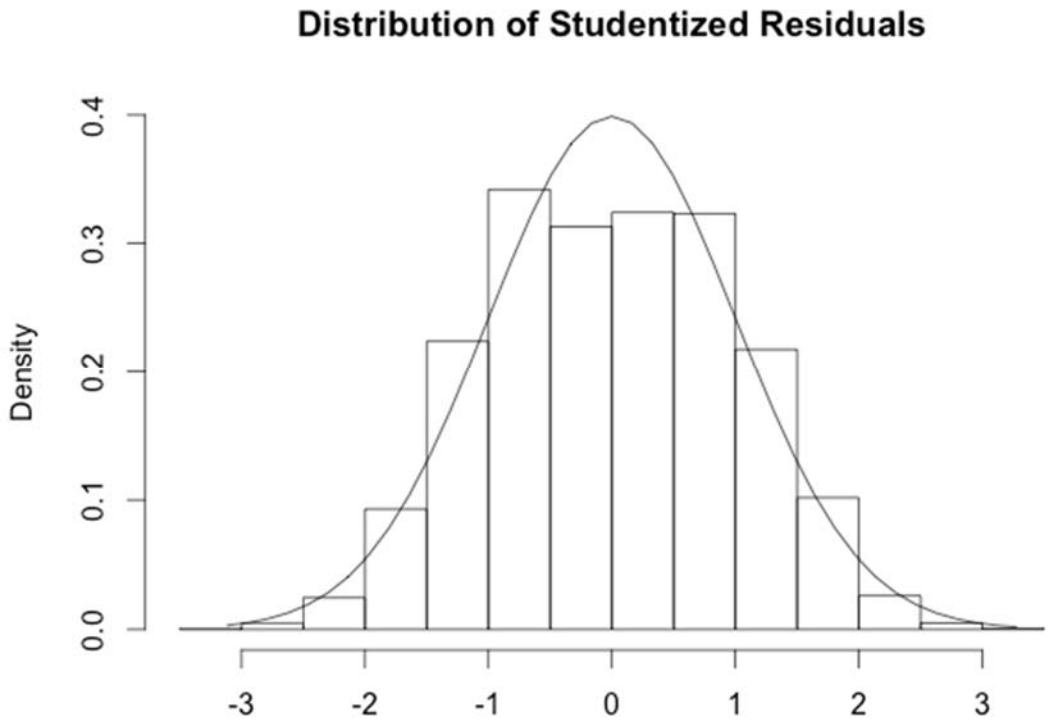


Figure B-2. Distribution of residuals from the aggregate model fit.

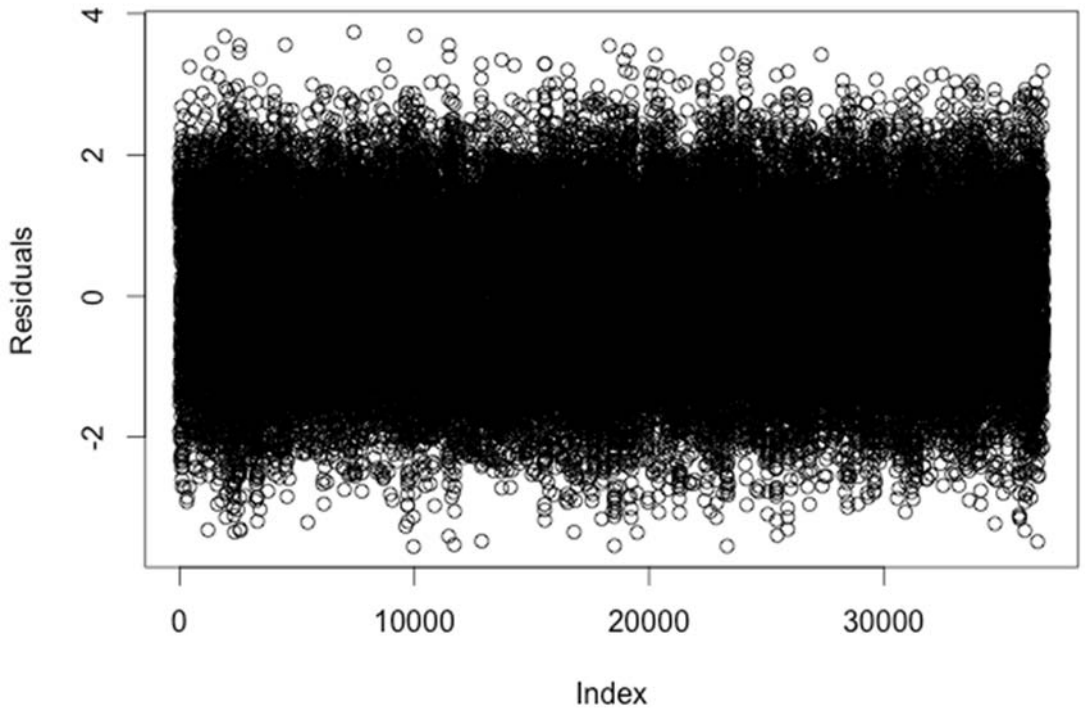


Figure B-3. Plot showing all residuals from the model fit. Residuals were centered around zero, and there was no trend that would suggest violations of regression assumptions.

B.2 Attribute Part-Worths Based on the Aggregate Model

Billets

Figure B-4 displays the increase in QoL associated with worst-to-best improvements in each of the billeting attributes[3]. The most important attributes within billeting were related to a Soldier's ability to get comfortable, uninterrupted rest. The type of bed was the most important attribute, with a 2.70% increase in QoL possible by improving bedding from the worst level (sleeping on the ground) to the best level (sleeping in a single bed). Temperature also mattered, with a 2.16% increase in QoL possible by improving temperature from 90 °F to 60 °F. Noise level was also important, with Soldiers preferring a normal, conversational level of background noise. One interesting finding was that QoL was more affected by the number of people sharing a living space than the area each Soldier had within a billet. Reducing the number of people sharing a living space from 18 (the standard for Force Provider billets) to 4 (the size of a fire team) improved QoL by 2.09%. In contrast, increasing the amount of space a Soldier had in his or her billets from 50 square feet to 110 square feet only improved QoL by 1.12%. Soldiers would apparently rather share tighter quarters with a smaller number of Soldiers (who they are more likely to know well and work with) than have more space within a larger group billet.

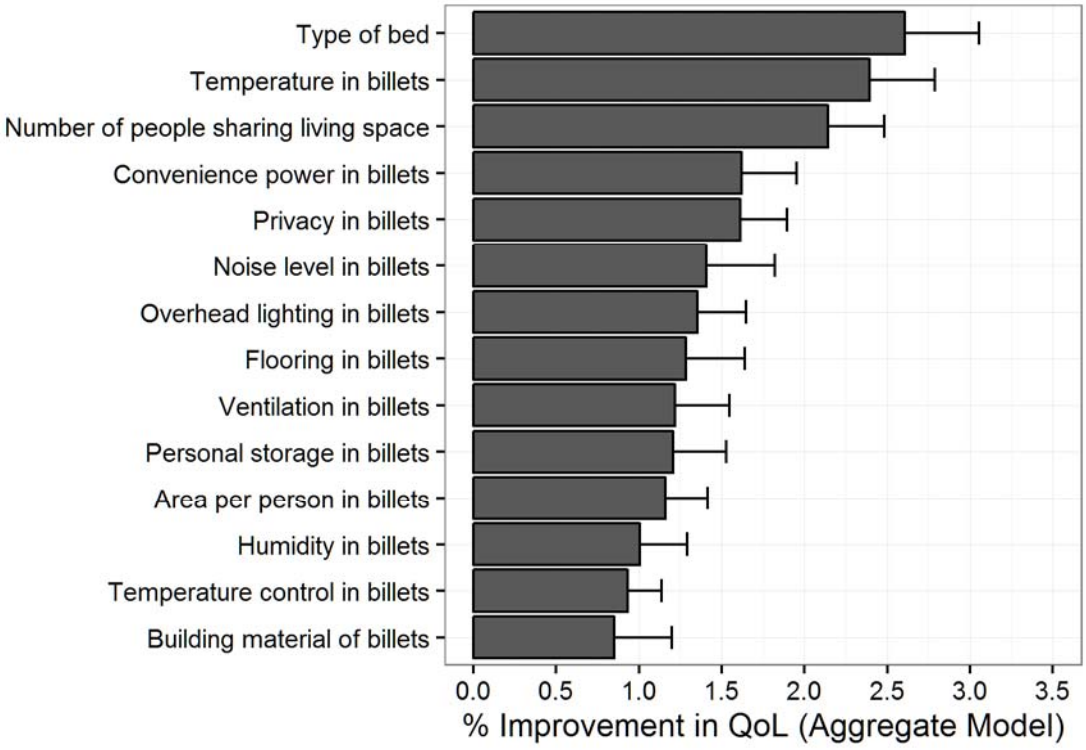


Figure B-4. Improvement in QoL associated with the difference between the worst and best levels of each billeting attribute.

[1] Coefficients presented in this Appendix have been normalized to create a 0-100 QoL score, such that the total of the best part-worth coefficients for all 84 attributes sums to 100.

Field Feeding

Figure B-5 displays the increase in QoL associated with worst-to-best improvements in each of the field feeding attributes. Access to supplemental and enhancement food items (milk, fresh fruits, salad, cereal, and bread) improved QoL by 1.98%. The ability to cool drinking water was also important, increasing QoL by 1.75%. Assuming the camp has a dining area, Soldiers also valued the temperature in that facility – improving dining area temperature from 90° F to 60° F was worth a 1.64% improvement in QoL. An interesting finding was that dinner appeared to contribute the most to QoL, but that the type of breakfast rations served mattered more than ration variety. This makes sense, as under field conditions breakfast and lunch are often eaten quickly before or during a Soldier's normal duties.

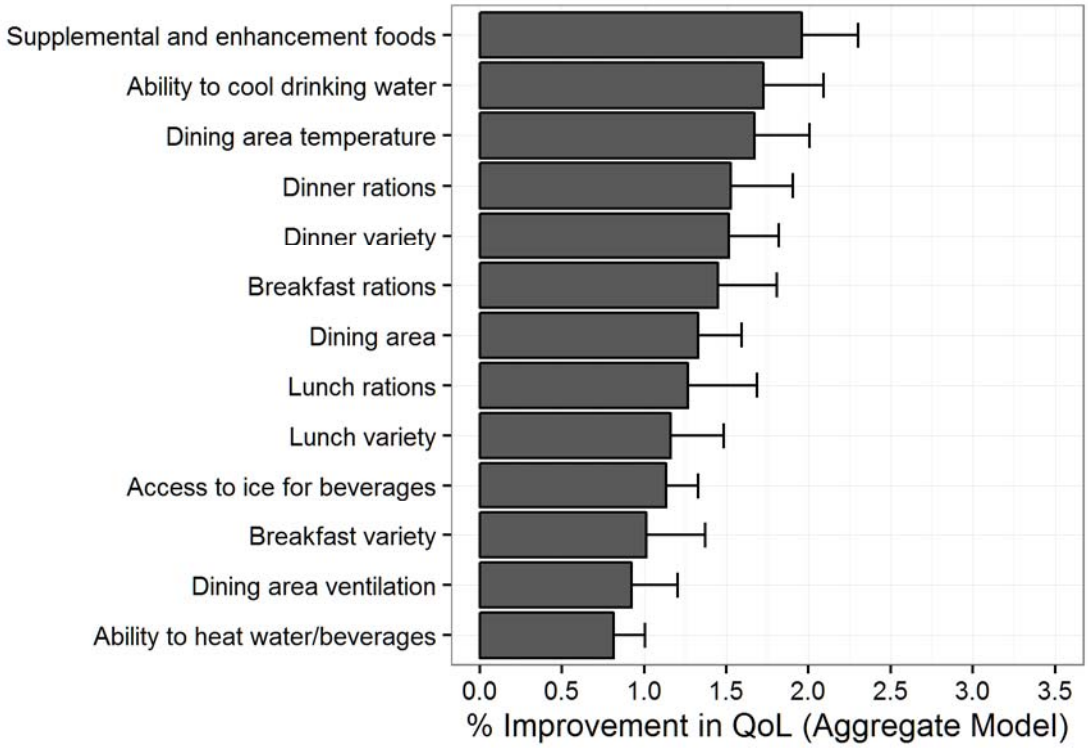


Figure B-5. Improvement in QoL associated with the difference between the worst and best levels of each field feeding attribute.

Hygiene

Figure B-6 displays the increase in QoL associated with worst-to-best improvements in each of the hygiene attributes. Overall, improving shower frequency had the largest contribution to QoL, with an improvement from once every three weeks to two or more times a day improving QoL by 2.60%. Shower structure, flow rate, and temperature control were also important hygiene attributes. Latrine structure was also important, with QoL increasing by 1.68% for an improvement from urination tubes and straddle trenches to flush toilets. In terms of laundry, Soldiers preferred to do it themselves, with a change from turn-in laundry service with a 7-day turnaround to self-service machine wash and dry improving QoL by 1.35%. This is consistent with qualitative reports from Soldiers about problems with off-post batch laundry losing their clothing and equipment or returning the wrong items.

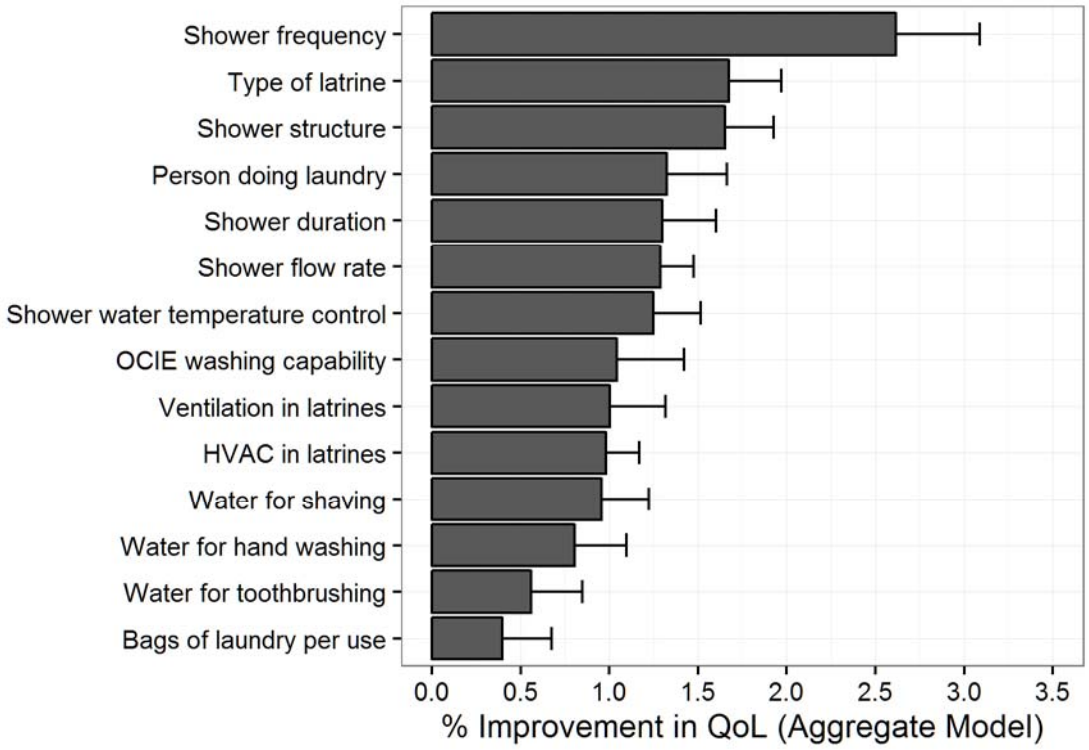


Figure B-6. Improvement in QoL associated with the difference between the worst and best levels of each field hygiene attribute.

MWR

Figure B-7 displays the increase in QoL associated with worst-to-best improvements in each of the MWR attributes. Having a variety of goods available through a PX mattered the most overall, with an increase of 2.02% possible by improving conditions from no PX goods to a range of personal care items and snacks. Access to SPAWAR/NIPR computers connected to the outside world was also critical. Increasing access to SPAWAR/NIPR computers from no access to giving each Soldier a personal laptop improved QoL by 1.90%. Enabling those computers to run video chat applications and connect to WiFi in billets improved QoL by 1.41% and 1.53% respectively. In a similar vein, improving access to phones for calling friends and family back home improved QoL by 1.60%. Access to adequate fitness facilities was also extremely important. In particular, providing a wide selection of weight-lifting equipment increased QoL by 1.72%.

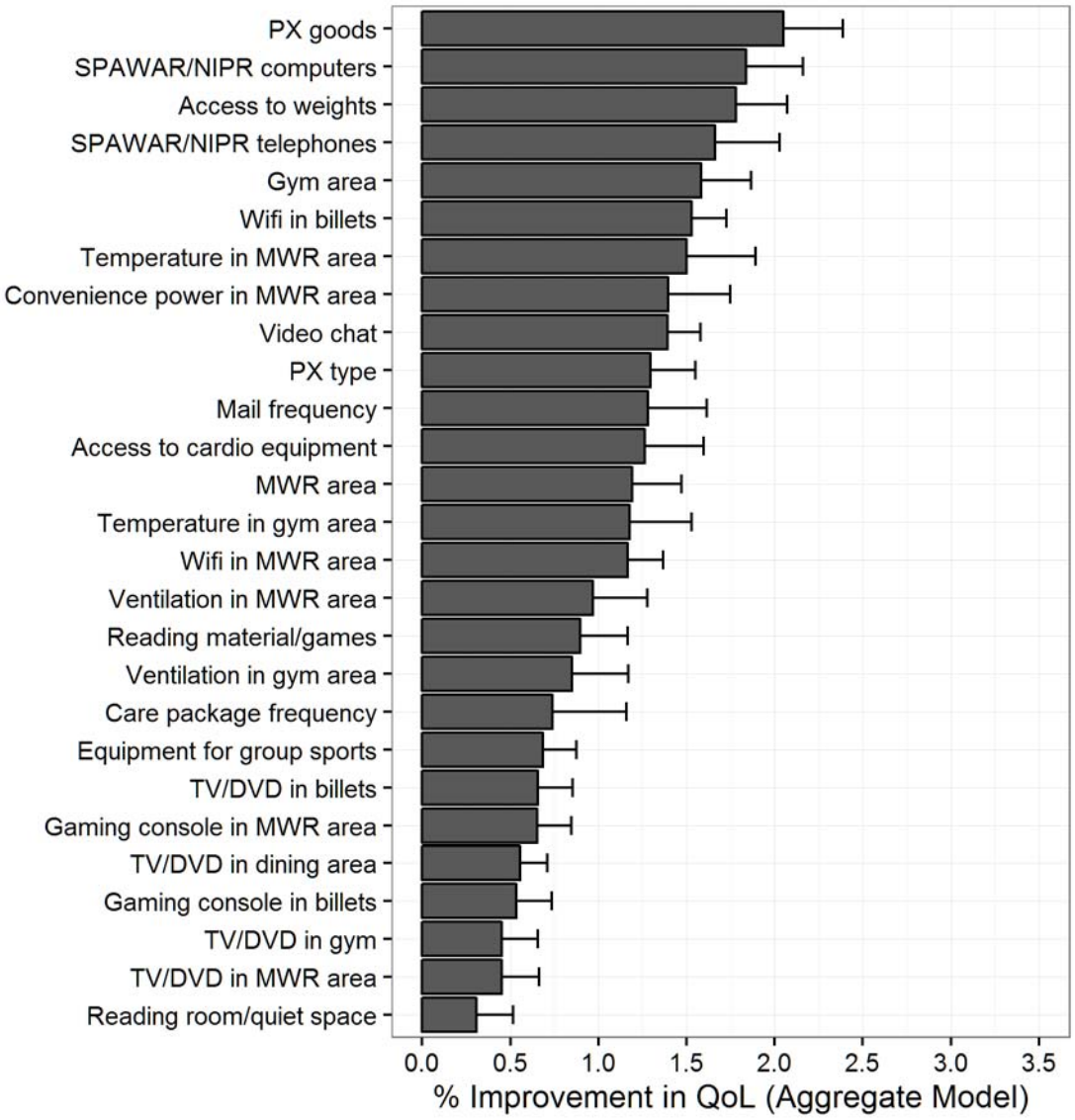


Figure B-7. Improvement in QoL associated with the difference between the worst and best levels of each MWR attribute.

Personal Security

Figure B-8 displays the increase in QoL associated with worst-to-best improvements in each of the personal security attributes. The ability to reduce body armor protection inside the wire from IOTV with front and back plates to no armor improved QoL by 2.68%. This was the largest increase in QoL of any attribute. Soldiers did not appear to care as much about locks on billets, latrines, or showers.

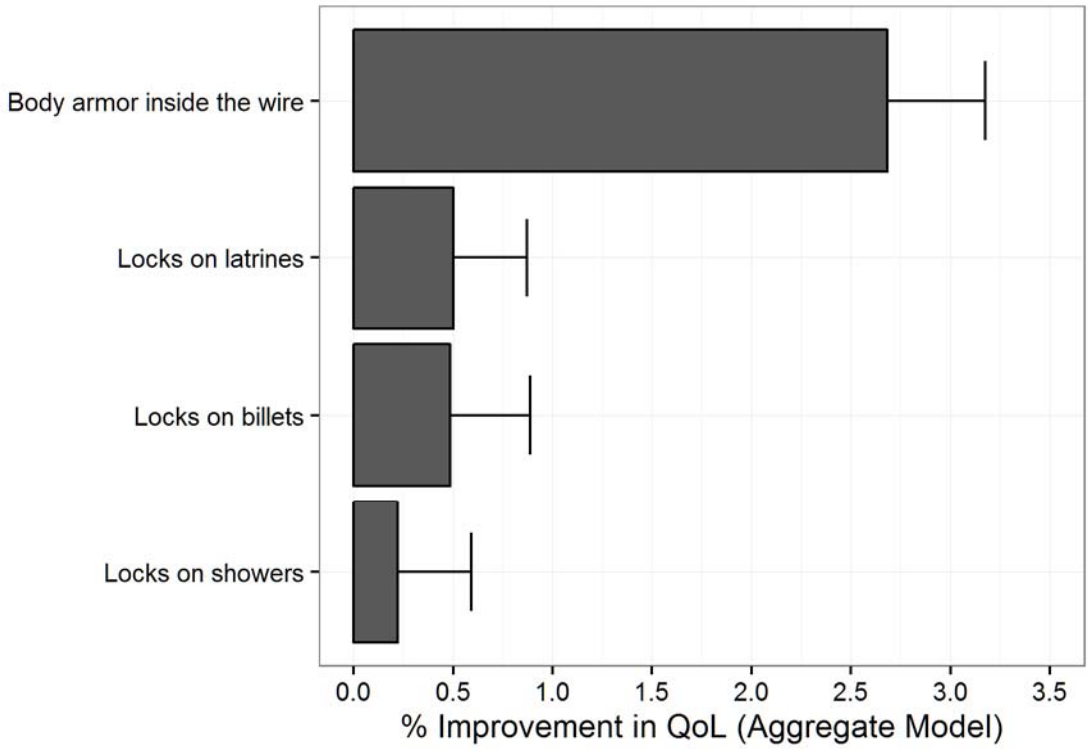


Figure B-8. Improvement in QoL associated with the difference between the worst and best levels of each personal security attribute.

Spiritual and Psychological Support

Figure B-9 displays the increase in QoL associated with worst-to-best improvements in each of the spiritual and psychological support attributes. Overall, spiritual and psychological support attributes were among some of the less important drivers of base camp QoL. Having access to some level of spiritual/psychological support was equally as important as having "sacred space", which could simply be a quiet area for reflection or prayer. Access to spiritual and psychological support rotating through the camp every 1-2 weeks improves QoL by 0.11%, though increasing the qualifications of that support from none to a chaplain of the Soldiers' denomination only provides a 0.50% increase in QoL. Overall, these data suggest that formal spiritual/psychological support are less important day-to-day, but perhaps more essential as targeted services provided to address specific challenges to individual or collective well-being (e.g., coping with casualties).

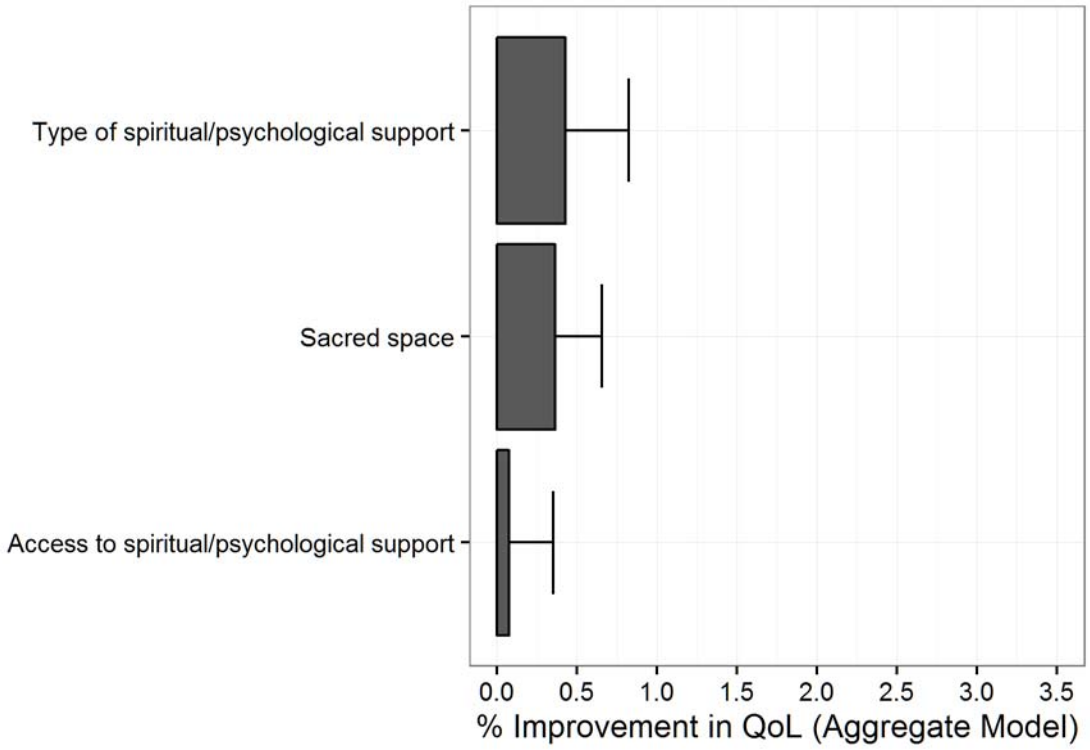


Figure B-9. Improvement in QoL associated with the difference between the worst and best levels of each spiritual/psychological support attribute.

Work Area

Figure B-10 displays the increase in QoL associated with worst-to-best improvements in each of the work area attributes. Soldiers desired access to convenience power for personal electronics (e.g., iPods or other MP3 players), with a 1.79% improvement in QoL possible by providing Soldiers with enough power to run multiple personal devices. Temperature was also important, with a 1.61% increase in QoL attainable by keeping workplace temperature in the 60-70 °F range. The ability to precisely control temperature was much less important, indicating that a centrally controlled HVAC system would be fine with most Soldiers. Having a dedicated latrine in the work area was not important, which makes sense in the context of a small or extra small base camp, which would have latrines easily accessible from most points within the camp.

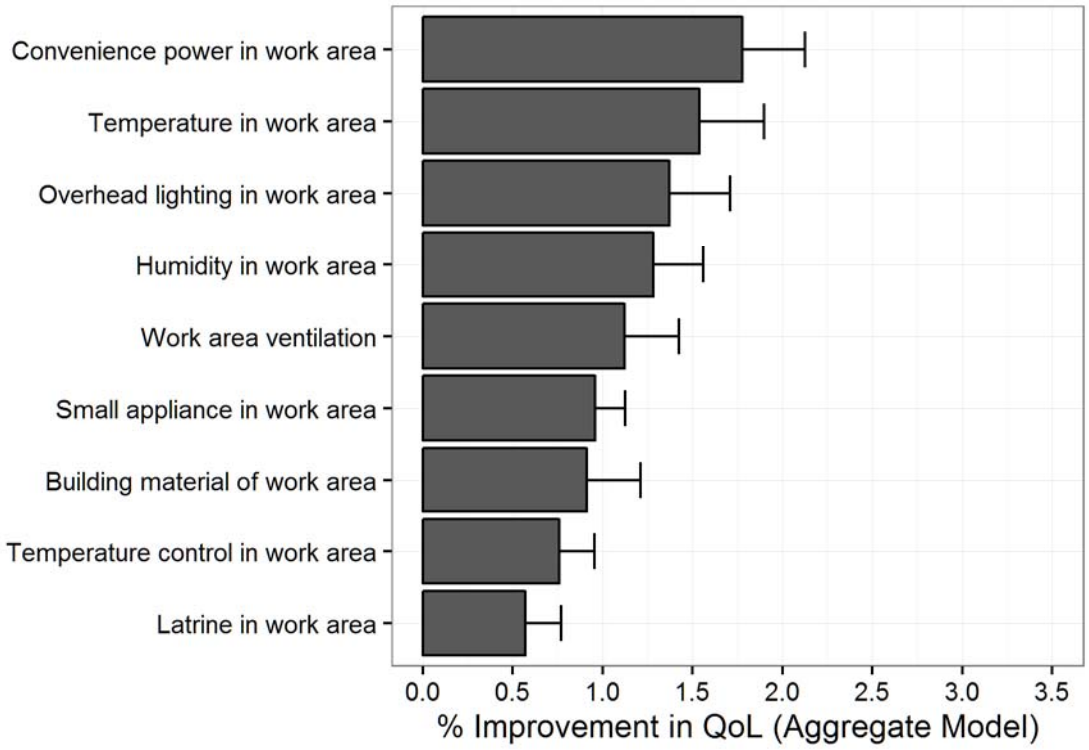


Figure B-10. Improvement in QoL associated with the difference between the worst and best levels of each work area attribute.

References

Cowles, M. K., & Carlin, B. P. (1996). Markov Chain Monte Carlo convergence diagnostics: a comparative review. *Journal of the American Statistical Association, 91*(434), 883-904.

Geweke, J. (1992). Evaluating the accuracy of sampling-based approaches to calculating posterior moments. In *Bayesian Statistics 4* (ed. J.M. Bernardo, J.O. Berger, A.P. Dawid and A.F.M. Smith). Clarendon
Press, Oxford, UK.

Heidelberger, P., & Welch, P. D. (1981). A spectral method for confidence interval generation and run length control in simulations. *Communications of the ACM, 24*(4), 233-245.

Appendix C: Part-Worths by Attribute

This appendix presents analysis of the part-worth data for each attribute. For each attribute, a set of Bonferroni-corrected[4] t-tests was conducted on the individual-level coefficients for each attribute level to assess difference from zero (i.e., difference from the reference level). In addition, individual-level coefficients were analyzed using Analysis of Variance (ANOVA) with attribute level as a within-subjects variable and gender, MOS (combat, support), rank (junior enlisted, senior enlisted, office), primary work location (outside the camp, inside the camp) and primary camp experience (fewer than 50 personnel, 51-300 personnel, 301-1000 personnel) as between-subjects variables. Given that the primary interest in this study is the effect of attribute level on QoL, the ANOVA included main effects of all factors and all two-way interactions between attribute level and the between-subjects demographic variables. Interactions among the demographic factors were excluded from the analysis, as were all higher-order interactions. Post hoc comparisons were completed using Bonferroni-corrected t-tests.

The following tables provide a summary of the ANOVA results for each attribute, organized by functional area[5]. The analysis details provided after the tables provide specific results along with a complete record of the raw, non-normalized mean and standard deviation of the individual-level coefficients from the utility model. To support connecting these coefficients with the normalized values presented in the boy of this report, the following tables provide the normalized coefficient for the best level of each attribute.

[4] Bonferroni-correction is a method for ensuring a given family-wise error rate for a collection of related analyses. It adjusts the probability of type I error $\alpha_{Bonf} = \alpha/m$, where m equals the number of tests to be conducted. For example, to conduct 4 t-tests at a desired family-wise $\alpha = .05$, the corrected α for each test will be $\alpha_{Bonf} = .05/4 = .0125$.

[5] Each table provides the regression coefficient of the "best level" for each attribute, that is, the level with the highest part-worth contribution to improving QoL. In contrast, the body of the report presents normalized coefficients that rescale the regression coefficients on a 0-100 percentile scale. This rescaling makes the values more intuitive (i.e., a 1.97% improvement in QoL is easier to grasp than an unscaled regression coefficient of 0.7305, representing an improvement in the log likelihood of choosing one camp over). This Appendix provides all of the raw, unscaled coefficients for archival purposes. Interested readers can rescale these values to match those in the body of the report using the formula $w_{scaled} = 100 * w_{unscaled}/37.0440$. The denominator in this equation is the sum of the best levels across all 84 attributes.

FIELD FEEDING									
Attribute	**Levels**	**Best Level**	**Att Level *(1)***	**Camp Size**	**Work Location**	**Gender**	**MOS**	**Rank**	**Comments**
Supplemental and enhancement food items	4	0.7305	***			AL			Females cared more about fresh fruits and vegetables than males.
Ability to cool drinking water	4	0.6366	***				*		Combat MOS > support MOS
Temperature in dining area	5	0.6210	***				AL		Combat MOS were more tolerant of 70°F than support MOS
Dinner rations	5	0.5627	***				*		- Rations other than MRE more important for support MOS than combat MOS.
Dinner ration variety	4	0.5628	***						
Breakfast rations	5	0.5378	***						Post hoc testing showed that all pairwise differences among levels were significantly different except for the difference between UGR-A and meals other than combat rations.
Dining area	3	0.4974	***						
Lunch rations	5	0.4726	***		AL		AL	AL	- Combat MOS had higher preference for UGR-E and lower preference for UGR-H&S and UGR-A vs. support MOS - Junior enlisted preferred UGR-A; Senior enlisted & officers preferred other - Soldiers working inside the wire had stronger preference for H&S
Lunch ration variety	4	0.4315	***						
Access to ice for cooling beverages	2	0.4222	***	***					Ice was more important for Soldiers who had stayed on camps housing 301-1000 pax.
Breakfast ration variety	4	0.3793	***						
Ventilation in dining area	4	0.3466	***						
Ability to heat water or other beverages	2	0.2988	***						
Category Total		6.4999							

* Significant at α = .05, ** Significant at α = .01, *** Significant at α = .001

AL = Attribute level interaction

Blank cells indicate effects that were not significant at the α = .05 level.

(1) All levels are significantly different than the reference level unless otherwise noted.

BILLETS									
Attribute	**Levels**	**Best Level**	**Att Level *(1)***	**Camp Size**	**Work Location**	**Gender**	**MOS**	**Rank**	**Comments**
Beds	6	0.9674	***			AL			- Male Soldiers were less averse than female Soldiers to hotswapping and bunked cots. - Male Soldiers had a stronger preference for having their own bed. - Female Soldiers were less averse than males to bunk beds or sleeping on an individual cot.
Temperature in billets	5	0.8879	***						
# of Soldiers in living Space	4	0.7883	***						
Power for personal electronics in billets	4	0.6014	***						
Privacy in billets	3	0.5974	***						
Noise level in billets	5	0.5190	***						
Overhead lighting in billets	4	0.5057	***						
Flooring in billets	5	0.4742	***						
Ventilation in billets	4	0.4509	***						
Personal storage in billets	4	0.4391	***						
Area per soldier in living space	3	0.4270	***						
Humidity level in billets	3	0.3733	***				*		Soldiers in support MOS cared more about humidity.
Temperature control in billets	2	0.3443	***			*			Males cared more about temperature control.
Building material of billets	4	0.3136	***						
Category Total		7.6895							

* Significant at α = .05, ** Significant at α = .01,
*** Significant at α = .001
AL = Attribute level interaction
Blank cells indicate effects that were not significant at the α = .05 level.
(1) All levels are significantly different than the reference level unless otherwise noted.

HYGIENE									
Attribute	**Levels**	**Best Level**	**Att Level *(1)***	**Camp Size**	**Work Location**	**Gender**	**MOS**	**Rank**	**Comments**
Shower frequency	5	0.9673	***					AL	Junior enlisted less averse to showering only once every three weeks compared with senior enlisted or officers
Latrine	4	0.6205	***						
Shower structure	3	0.6099	***	AL	*				- Soldiers on camps housing 50 or fewer personnel had a lower preference for improvised shower system. - Soldiers working inside the wire had a greater preference for showers with privacy.
Person doing laundry	5	0.4891	***						
Shower duration	4	0.4794	***						
Shower flow rate	2	0.4718	***						
Shower water temperature control	3	0.4685	***		AL				Soldiers working inside the wire placed a higher value on full shower water temperature control.
OCIE washing capability	5	0.3869	***					*	Officers cared more about OCIE washing than junior enlisted.
Ventilation in latrines	3	0.3682	***					AL	Officers had a relatively higher preference for windows and fans, and a relatively lower preference for adding air filtration.
HVAC in latrines	2	0.3665	***		**				Soldiers who worked inside the wire cared more about HVAC in latrines.
Water for shaving	3	0.3565	***		*				Soldiers who worked primarily inside the wire cared more about water for hand-washing
Water for hand washing	3	0.2981	***				*		Support MOS had higher preference than combat MOS.
Water for tooth brushing	3	0.2047	***						
Bags of laundry that can be done per use	3	0.1454	***				*		Soldiers in support MOS cared more about how many bags of laundry they could do.
Category Total		6.2328							

* Significant at α = .05, ** Significant at α = .01,
*** Significant at α = .001
AL = Attribute level interaction
Blank cells indicate effects that were not significant at the α = .05 level.
(1) All levels are significantly different than the reference level unless otherwise noted.

MWR									
Attribute	**Levels**	**Best Level**	**Att Level *(1)***	**Camp Size**	**Work Location**	**Gender**	**MOS**	**Rank**	**Comments**
PX/AAFES goods	4	0.7641	***						
SPAWAR/NIPR computers	4	0.6774	***						
Access to weights	4	0.6563	***				*		Combat MOS > support MOS
SPAWAR/NIPR telephones	5	0.6188	***						
Gym area	3	0.5902	***						
Wi-Fi in billets	2	0.5708	***						
Temperature in MWR area	5	0.5562	***						
Convenience power in MWR area	4	0.5221	***						
Video chat	2	0.5141	***						
PX/AAFES type	3	0.4803	***						
Mail frequency	5	0.4721	***						
Access to cardio equipment	4	0.4651	***						
MWR area	3	0.4385	***						
Temperature in gym area	5	0.4346	***						
Wi-Fi in MWR area	2	0.4307	***						
Ventilation in MWR area	4	0.3628	***						
Reading material	3	0.3346	***						
Ventilation in gym area	4	0.3132	***						
Care package frequency	5	0.2733	***						
Equipment for group sports	2	0.2564	***						
TV/DVD/VCR in Billets	2	0.2419	***						
Gaming console in MWR area	2	0.2389	***			*			Males had a stronger preference than females.
TV/DVD/VCR in Dining area	2	0.1980	***						
Gaming console in Billets	2	0.1924	***						
TV/DVD/VCR in MWR area	2	0.1714	***						

MWR									
Attribute	**Levels**	**Best Level**	**Att Level *(1)***	**Camp Size**	**Work Location**	**Gender**	**MOS**	**Rank**	**Comments**
TV/DVD/VCR in Gym area	2	0.1703	***		*				Soldiers who worked primarily inside the wire cared more about having a TV/DVD in their gym
Reading room/quiet space	2	0.1146	***			*			Females cared more than males about having a reading room/quiet space.
Category Total		11.0593							

* Significant at α = .05, ** Significant at α = .01

AL = Attribute level interaction

Blank cells indicate effects that were not significant at the α = .05 level.

(1) All levels are significantly different than the reference level unless otherwise noted.

PERSONAL SECURITY									
Attribute	**Levels**	**Best Level**	**Att Level *(1)***	**Camp Size**	**Work Location**	**Gender**	**MOS**	**Rank**	**Comments**
Body armor inside the wire	6	0.9936	***				*		Combat MOS cared more about armor level overall than support MOS
Locks on latrines	5	0.1822	***						
Locks on billets	5	0.1816	***						
Locks on showers	5	0.0822	***						
Category Total		1.4396							

* Significant at α = .05, ** Significant at α = .01,
*** Significant at α = .001

AL = Attribute level interaction

Blank cells indicate effects that were not significant at the α = .05 level.

(1) All levels are significantly different than the reference level unless otherwise noted.

SPIRITUAL AND PSYCHOLOGICAL SUPPORT									
Attribute	**Levels**	**Best Level**	**Att Level *(1)***	**Camp Size**	**Work Location**	**Gender**	**MOS**	**Rank**	**Comments**
Level of spiritual and psychological support	5	0.1898	***						
Sacred space	3	0.1306	***						
Access to spiritual/psychological support	3	0.0276							
Category Total		0.3180							

* Significant at α = .05, ** Significant at α = .01

AL = Attribute level interaction

Blank cells indicate effects that were not significant at the α = .05 level.

(1) All levels are significantly different than the reference level unless otherwise noted.

WORK AREA									
Attribute	**Levels**	**Best Level**	**Att Level *(1)***	**Camp Size**	**Work Location**	**Gender**	**MOS**	**Rank**	**Comments**
Convenience power in work area	4	0.6527	***			*			Females cared more than males about convenience power.
Temperature in work area	5	0.5757	***				*		Combat MOS > support MOS
Overhead lighting in work area	4	0.5065	***				*		Combat MOS preferred multiple light banks w/ separate switches
Humidity level in work area	3	0.4784	***				*		Support MOS > combat MOS
Ventilation in work area	4	0.4162	***				*		Combat MOS > support MOS
Convenience electronics in work area	2	0.3473	***	*	*			*	- Senior enlisted cared more than junior enlisted or officers. - Soldiers working inside the wire cared more than those working outside the wire. - Soldiers who stayed on camps housing 50 or fewer pax cared more than Soldiers who stayed on larger camps.
Building material of work area	4	0.3387	***						
Temperature control in work area	2	0.2804	***						
Dedicated latrine in work area	2	0.2089	***						
Category Total		3.8048							

* Significant at α = .05, ** Significant at α = .01,
** Significant at α = .001

AL = Attribute level interaction

Blank cells indicate effects that were not significant at the α = .05 level.

(1) All levels Are significantly different than the reference level unless otherwise noted.

FIELD FEEDING

Availability of Supplemental and Enhancement Food Items

The availability of supplemental and enhancement food items attribute addressed whether Soldiers would have access to milk, salad, fresh fruits/vegetables, bread, and cereal on a base camp. The levels of this attribute were:

- None (reference)
- Milk only
- Milk, bread, and cereal
- Milk, bread, cereal, and fresh fruits/vegetables

The following table presents the mean and standard deviation for each non-reference level as well as the results of t-tests comparing each level against zero (an asterisk in the "sig" column indicates the test was significant at the given adjusted alpha):

Level	Mean	SD	t	df	sig (α_{Bonf} = .0167)
Milk only	0.1399	0.1775	27.62	1226	*
Mild, bread, cereal	0.5593	0.1807	108.44	1226	*
Milk, bread, cereal, fresh fruits/vegetables	0.7305	0.1813	141.13	1226	*

An ANOVA revealed a main effect of attribute level, $F(2, 2438) = 3366.59$, $p < .001$. Post hoc testing showed that all pairwise differences among levels were significantly different. In addition, there was an interaction between level and gender, $F(2, 2438) = 3.33$, $p < .05$. As shown in Figure C-1, male Soldiers had a slightly stronger preference than females for having milk and bread/cereal. However, female Soldiers had a stronger preference for also having access to fresh fruits and vegetables. There were no other main effects or interactions.

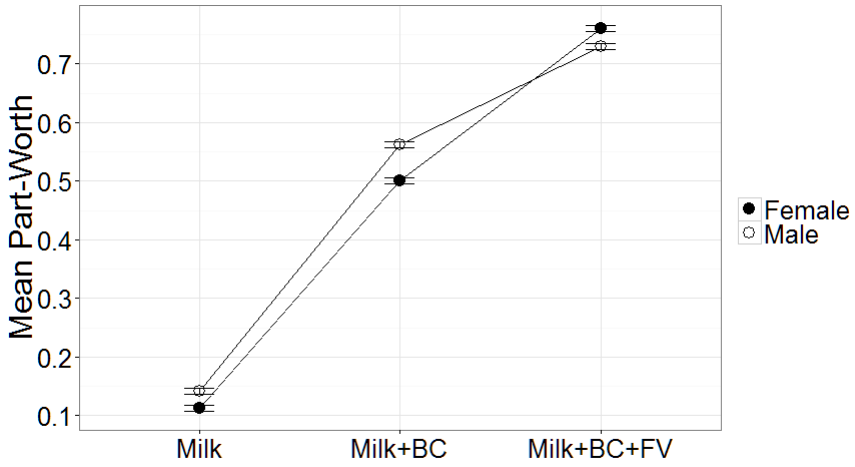


Figure C-1. Interaction between supplemental/enhancement food item level and gender. Error bars represent plus and minus one standard error. BC = bread and cereal; FV = fresh fruits and vegetables.

Ability to Cool Drinking Water

The ability to cool drinking water attribute addressed whether a base camp provides a way to keep drinking water cool through refrigeration or other means. The levels of this attribute were:

- None (reference)
- Sunshade
- Air conditioned storage
- Refrigerated storage

The following table presents the mean and standard deviation for each non-reference level as well as the results of t-tests comparing each level against zero (an asterisk in the "sig" column indicates the test was significant at the given adjusted alpha):

Level	Mean	SD	t	df	sig (α_{Bonf} = .0167)
Sunshade	0.1387	0.1796	27.04	1226	*
Air conditioned storage	0.5169	0.1866	96.99	1226	*
Refrigerated storage	0.6366	0.1914	116.50	1226	*

An ANOVA revealed a main effect of attribute level, $F(2, 2438) = 2396.79$, $p < .001$. Post hoc testing showed that all pairwise differences among levels were significantly different. In addition, there was a main effect of MOS, $F(1, 1219) = 4.73$, $p < .05$. Soldiers in combat MOS cared more about having the ability to cool beverages ($M = 0.4387$, $SD = 0.2799$) than Soldiers in support MOS ($M = 0.4256$, $SD = 0.2836$). There were no other main effects or interactions.

Temperature in the Dining Area

This attribute addressed the temperature in a base camp dining area. The levels of this attribute were:

- 90 °F (reference)
- 80 °F
- 70 °F
- 60 °F
- 50 °F

The following table presents the mean and standard deviation for each non-reference level as well as the results of t-tests comparing each level against zero (an asterisk in the "sig" column indicates the test was significant at the given adjusted alpha):

Level	Mean	SD	t	df	sig (α_{Bonf} = .0125)
80 °F	0.3448	0.1737	69.52	1226	*
70 °F	0.5579	0.1812	107.84	1226	*
60 °F	0.6210	0.1716	126.73	1226	*
50 °F	0.4708	0.1746	94.44	1226	*

An ANOVA revealed a main effect of attribute level, $F(3, 3657) = 561.46$, $p < .001$. Post hoc testing showed that all pairwise differences among levels were significantly different. In addition, there was an interaction between level and MOS, $F(3, 3657) = 2.96$, $p < .05$. As shown in Figure C-2, the preference ratings of combat and support MOS Soldiers were largely the same other than at 70 °F, which was viewed as more acceptable (i.e., higher relative part-worth) by Soldiers in support MOS. There were no other main effects or interactions.

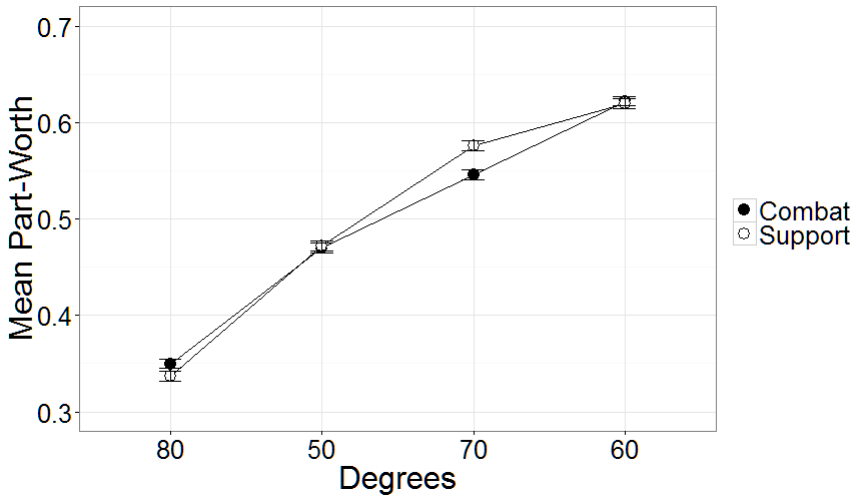


Figure C-2. Interaction between dining shelter temperature level and MOS. Error bars represent plus and minus one standard error.

Dinner Rations

The dinner rations attribute covered dinner-related ration options, including standard U.S. military rations and "home cooked" meals prepared with foods purchased off the local economy. The levels of the dinner ration attribute were:

- MREs (reference level)
- UGR-E
- UGR-H&S
- UGR-A
- Meals prepared from sources other than combat rations

The following table presents the mean and standard deviation for each non-reference level as well as the results of t-tests comparing each level against zero (an asterisk in the "sig" column indicates the test was significant at the given adjusted alpha):

Level	Mean	SD	t	df	sig (α_{Bonf} = .0125)
UGR-E	0.4165	0.1799	81.11	1226	*
UGR-H&S	0.3333	0.1756	66.46	1226	*
UGR-A	0.5156	0.1787	101.08	1226	*
Other	0.5627	0.1731	113.84	1226	*

An ANOVA revealed a main effect of attribute level, $F(3, 3657) = 402.26$, $p < .001$. Post hoc testing showed that all pairwise differences among levels were significantly different. In addition, the main effect of MOS was significant, $F(1, 1219) = 5.06$, $p < .05$, with Soldiers in support MOS preferring something other than a MRE for dinner more ($M = 0.4647$, $SD = 0.1986$) than Soldiers in combat MOS ($M = 0.4519$, $SD = 0.1972$). There were no other main effects or interactions.

Dinner Ration Variety

The dinner ration variety attribute addressed the issue of variety in the ration menus available to Soldiers on a base camp. The levels of the dinner ration variety attribute were:

- Same dinner every day for a month (reference level)
- Same dinner every day for 2 weeks
- Same dinner every day for a week
- No dinner repeats over the course of a week

The following table presents the mean and standard deviation for each non-reference level as well as the results of t-tests comparing each level against zero (an asterisk in the "sig" column indicates the test was significant at the given adjusted alpha):

Level	Mean	SD	t	df	sig (α_{Bonf} = .0167)
Same every day for 2 weeks	0.1242	0.1832	23.74	1226	*
Same every day for a week	0.2578	0.1729	52.25	1226	*
No repeats over a week	0.5629	0.1794	109.92	1226	*

An ANOVA revealed a main effect of attribute level, $F(2, 2438) = 1912.39$, $p < .001$. Post hoc testing showed that all pairwise differences among levels were significantly different. There were no other main effects or interactions.

Breakfast Rations

The breakfast rations attribute covered breakfast-related ration options, including standard U.S. military rations and "home cooked" meals prepared with foods purchased off the local economy. The levels of the breakfast ration attribute were:

- Meals Ready to Eat (MREs) (reference level)
- Unitized Group Ration-Express (UGR-E)
- UGR-Heat and Serve (UGR H&S)
- UGR-A
- Meals prepared from sources other than combat rations

The following table presents the mean and standard deviation for each non-reference level as well as the results of t-tests comparing each level against zero (an asterisk in the "sig" column indicates the test was significant at the given adjusted alpha):

Level	Mean	SD	t	df	sig ($\alpha_{Bonf} = .0125$)
UGR-E	0.3181	0.1843	60.47	1226	*
UGR-H&S	0.3963	0.1794	77.37	1226	*
UGR-A	0.5362	0.1743	107.76	1226	*
Other	0.5378	0.1793	105.09	1226	*

An ANOVA revealed a main effect of attribute level, $F(3, 3657) = 439.45$, $p < .001$. Post hoc testing showed that all pairwise differences among levels were significantly different except for the difference between UGR-A and meals other than combat rations. There were no other main effects or interactions.

Dining Area

This attribute addressed the kind of dining facilities available to Soldiers. The levels of this attribute were:

- No dedicated dining area (reference)
- Tent/shelter without HVAC
- Tent/shelter with HVAC

The following table presents the mean and standard deviation for each non-reference level as well as the results of t-tests comparing each level against zero (an asterisk in the "sig" column indicates the test was significant at the given adjusted alpha):

Level	Mean	SD	t	df	sig ($\alpha_{Bonf} = .025$)
Tent/shelter without HVAC	0.2248	0.1798	43.79	1226	*
Tent/shelter with HVAC	0.4974	0.1898	91.75	1226	*

An ANOVA revealed a main effect of attribute level, $F(1, 1219) = 1295.05$, $p < .001$. Post hoc testing showed that all pairwise differences among levels were significantly different. There were no other main effects or interactions.

Lunch Rations

The lunch rations attribute covered lunch-related ration options, including standard U.S. military rations and "home cooked" meals prepared with foods purchased off the local economy. The levels of the lunch ration attribute were:

- MREs (reference level)
- UGR-E
- UGR-H&S
- UGR-A
- Meals prepared from sources other than combat rations

The following table presents the mean and standard deviation for each non-reference level as well as the results of t-tests comparing each level against zero (an asterisk in the "sig" column indicates the test was significant at the given adjusted alpha):

Level	Mean	SD	t	df	sig ($\alpha_{Bonf} = .0125$)
UGR-E	0.2593	0.1832	60.47	1226	*
UGR-H&S	0.4050	0.1705	77.37	1226	*
UGR-A	0.4262	0.1779	107.76	1226	*
Other	0.4726	0.1911	105.09	1226	*

An ANOVA revealed a main effect of attribute level, $F(3, 3657) = 305.03.45$, $p < .001$. Post hoc testing showed that all pairwise differences among levels were significantly different. In addition, the interaction between level and MOS was significant, $F(3, 3657) = 3.89$, $p < .01$. As shown in Figure C-3, Soldiers in combat MOS had a lower preference for UGR-H&S compared with Soldiers in support MOS, but a greater preference for UGR-E. In fact, for combat MOS Soldiers the difference between UGR-E and UGR-A was not statistically significant, $t(741) = 0.65$, $p = 0.52$. In addition, the interaction between level and rank was significant, $F(6, 3657) = 3.14$, $p < .01$. As shown in Figure C-4, junior enlisted (ranks E1 through E4) had a stronger preference for having UGR-As for lunch compared with senior enlisted (E5 through E9) or officers. In contrast, officers and senior enlisted had a stronger preference for meals other than combat rations compared with junior enlisted. Finally, there was a significant interaction between level and work location, $F(3, 3657) = 2.78$, $p < .05$, as shown in Figure C-5. Soldiers who worked primarily inside the wire viewed UGR-H&S more favorably than Soldiers who worked primarily outside the wire. In contrast, Soldiers who worked primarily inside the wire had a relatively lower preference for UGR-A and meals other than combat rations than Soldiers who worked outside the wire.

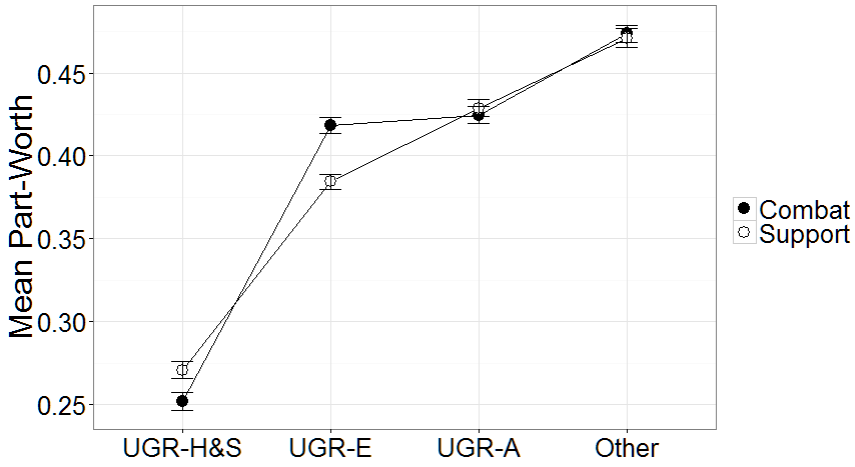


Figure C-3. Interaction between lunch ration level and MOS. Error bars represent the standard error of the mean.

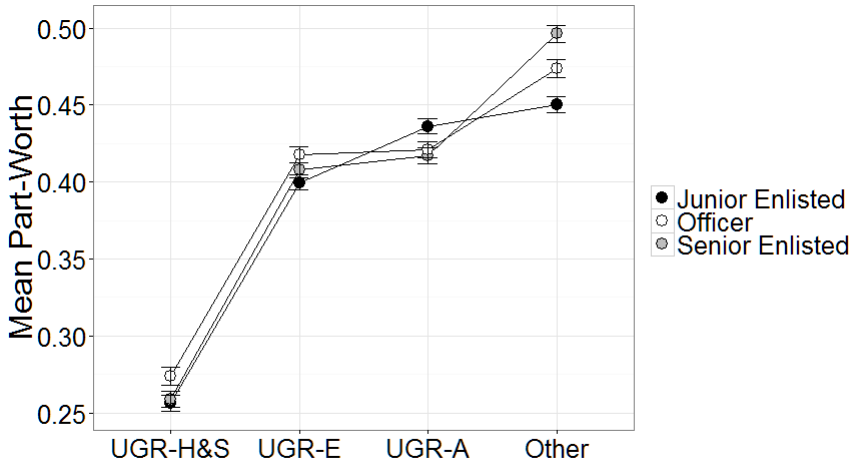


Figure C-4. Interaction between lunch ration level and rank. Error bars represent the standard error of the mean.

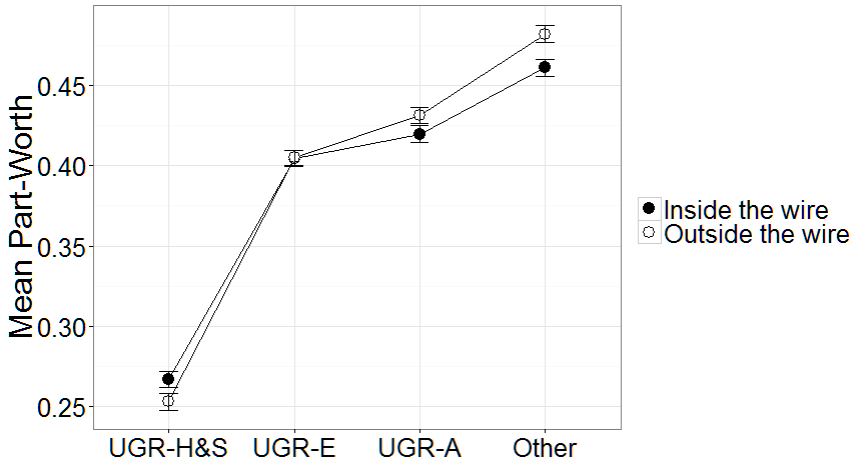


Figure C-5. Interaction between lunch ration level and primary work location. Error bars represent the standard error of the mean.

Lunch Ration Variety

The lunch ration variety attribute addressed the issue of variety in the ration menus available to Soldiers on a base camp. The levels of the lunch ration variety attribute were:

- Same lunch every day for a month (reference level)
- Same lunch every day for 2 weeks
- Same lunch every day for a week
- No lunch repeats over the course of a week

The following table presents the mean and standard deviation for each non-reference level as well as the results of t-tests comparing each level against zero (an asterisk in the "sig" column indicates the test was significant at the given adjusted alpha):

Level	Mean	SD	t	df	sig (α_{Bonf} = .0167)
Same every day for 2 weeks	0.2032	0.1799	39.55	1226	*
Same every day for a week	0.2263	0.1839	43.11	1226	*
No repeats over a week	0.4315	0.1815	83.29	1226	*

An ANOVA revealed a main effect of attribute level, $F(2, 2438) = 587.49$, $p < .001$. Post hoc testing showed that all pairwise differences among levels were significantly different. There were no other main effects or interactions.

Access to Ice for Cooling Beverages

This attribute addressed whether Soldiers had access to ice for cooling water and other beverages. The levels of this attribute were:

- No (reference)
- Yes

The following table presents the mean and standard deviation for each non-reference level as well as the results of t-tests comparing each level against zero (an asterisk in the "sig" column indicates the test was significant at the given adjusted alpha):

Level	Mean	SD	t	df	sig (α_{Bonf} = .05)
Yes	0.4222	0.2019	73.24	1226	*

An ANOVA revealed a main effect of camp experience, F(2, 1219) = 4.24, p <.001. Post hoc testing showed that Soldiers who spent most of their time at camps housing 301-1000 personnel cared more about access to ice (M = 0.4384, SD = 0.1947) than Soldiers with the most experience on camps housing 301-1000 personnel (M = 0.4041, SD = 0.1986). There were no differences among these Soldiers and Soldiers with the most experience on camps housing 50 or fewer personnel (M = 0.4279, SD = 0.2208). There were no other main effects or interactions.

Breakfast Ration Variety

The breakfast ration variety attribute addressed the issue of variety in the ration menus available to Soldiers on a base camp. The levels of the breakfast ration variety attribute were:

- Same breakfast every day for a month (reference level)
- Same breakfast every day for 2 weeks
- Same breakfast every day for a week
- No breakfast repeats over the course of a week

The following table presents the mean and standard deviation for each non-reference level as well as the results of t-tests comparing each level against zero (an asterisk in the "sig" column indicates the test was significant at the given adjusted alpha):

Level	Mean	SD	t	df	sig (α_{Bonf} = .0167)
Same every day for 2 weeks	0.1587	0.1841	30.21	1226	*
Same every day for a week	0.2556	0.1799	49.75	1226	*
No repeats over a week	0.3793	0.1894	70.15	1226	*

An ANOVA revealed a main effect of attribute level, F(2, 2438) = 441.49, p <.001. Post hoc testing showed that all pairwise differences among levels were significantly different. There were no other main effects or interactions.

Ventilation in the Dining Facility

This attribute addressed the kind of ventilation available in a base camp dining facility. The levels of this attribute were:

- Doors opening and closing
- Windows
- Windows and fans
- Windows and fans with an air filtration system

The following table presents the mean and standard deviation for each non-reference level as well as the results of t-tests comparing each level against zero (an asterisk in the "sig" column indicates the test was significant at the given adjusted alpha):

Level	Mean	SD	t	df	sig (α_{Bonf} = .0167)
Windows	0.0997	0.1763	19.82	1226	*
Windows and fans	0.2784	0.1906	51.16	1226	*
Windows and fans with air filtration	0.3466	0.1794	67.68	1226	*

An ANOVA revealed a main effect of attribute level, $F(2, 2438) = 589.15$, $p < .001$. Post hoc testing showed that all pairwise differences among levels were significantly different. There were no other main effects or interactions.

Ability to Heat Water and other Beverages

This attribute addressed whether Soldiers had access to means of heating water and other beverages, including coffee, tea, and soup. The levels of this attribute were:

- No (reference)
- Yes

The following table presents the mean and standard deviation for each non-reference level as well as the results of t-tests comparing each level against zero (an asterisk in the "sig" column indicates the test was significant at the given adjusted alpha):

Level	Mean	SD	t	df	sig (α_{Bonf} = .05)
Yes	0.2988	0.972	53.08	1226	*

There were no main effects of any of the demographic variables.

Billets

Type of Bed

This attribute addressed the kind of bed Soldiers might have in their billets. The levels of this attribute were:

- Sleeping on the floor/ground (reference)
- Hot-swapping
- Sleeping on one cot of bunked cots
- Sleeping on one bed of bunked beds
- Sleeping on your own cot
- Sleeping on your own single bed

The following table presents the mean and standard deviation for each non-reference level as well as the results of t-tests comparing each level against zero (an asterisk in the "sig" column indicates the test was significant at the given adjusted alpha):

Level	Mean	SD	t	df	Sig (α_{Bonf} = .01)
Hot-swapping	0.0444	0.1862	8.36	1226	*
Bunked cot	0.4046	0.1698	83.46	1226	*
Single cot	0.6574	0.1732	132.97	1226	*
Bunked bed	0.6722	0.1755	134.18	1226	*
Single bed	0.9674	0.1874	180.80	1226	*

An ANOVA revealed a main effect of attribute level, $F(4, 4876) = 4472.65$, $p < .001$. Post hoc testing showed that all pairwise differences among levels were significantly different except for the difference between sleeping in a bunked bed versus a single cot. In addition, there was an interaction between attribute level and gender, $F(4, 4876) = 2.56$, $p < .05$. As shown in Figure C10, male Soldiers were less averse than female Soldiers to hotswapping and bunked cots. Male Soldiers also had a stronger preference than females for having their own bed. Female Soldiers, in contrast, were less averse than males to bunk beds or sleeping on an individual cot. There were no other main effects or interactions.

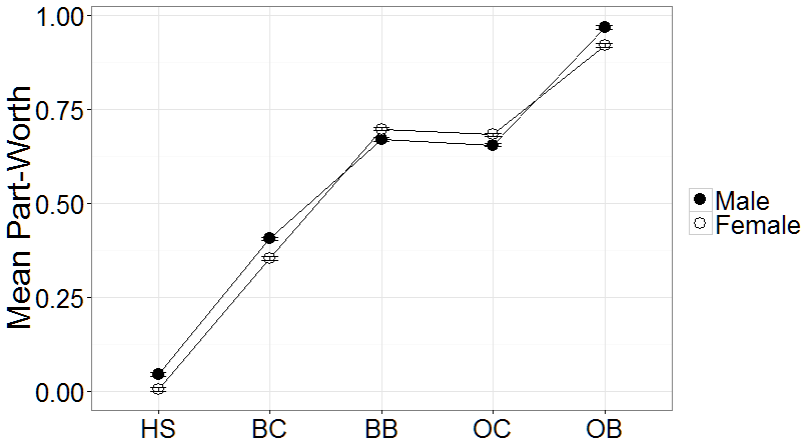


Figure C-6. Interaction between bed level and gender. HS = hotswapping, BC = bunked cots, BB = bunk beds, OC = own cot, OB = own bed. Error bars represent plus and minus one standard error.

Temperature in Billets

This attribute addressed the temperature in base camp billets. The levels of this attribute were:

- 90 °F (reference)
- 80 °F
- 70 °F
- 60 °F
- 50 °F

The following table presents the mean and standard deviation for each non-reference level as well as the results of t-tests comparing each level against zero (an asterisk in the "sig" column indicates the test was significant at the given adjusted alpha):

Level	Mean	SD	t	df	Sig (α_{Bonf} = .0125)
80 °F	0.4014	0.1717	81.87	1226	*
70 °F	0.6994	0.1750	139.95	1226	*
60 °F	0.8273	0.1870	154.96	1226	*
50 °F	0.8879	0.1773	175.38	1228	*

An ANOVA revealed a main effect of attribute level, $F(3, 3657) = 1782.53$, $p < .001$. Post hoc testing showed that all pairwise differences among levels were significantly different. There were no other main effects or interactions.

Number of Soldiers in Living Space

This attribute addressed the number of Soldiers that are required to share billeting space. The levels of this attribute were:

- 18 (reference)
- 9
- 4
- 2

The following table presents the mean and standard deviation for each non-reference level as well as the results of t-tests comparing each level against zero (an asterisk in the "sig" column indicates the test was significant at the given adjusted alpha):

Level	Mean	SD	t	df	Sig (α_{Bonf} = .0167)
9	0.3341	0.1788	65.74	1226	*
4	0.5964	0.1735	120.42	1226	*
2	0.7883	0.1879	146.89	1226	*

An ANOVA revealed a main effect of attribute level, $F(2, 2438) = 1993.24$, $p < .001$. Post hoc testing showed that all pairwise differences among levels were significantly different. There were no other main effects or interactions.

Power for Personal Electronics in Billets

This attribute addressed whether Soldiers have access to convenience power for personal electronics in their billets. The levels of this attribute were:

- None (reference)
- Enough to power up to three small devices, such as an iPod
- Enough to power one medium device, such as a laptop
- Enough to power one medium device and up to three small devices

The following table presents the mean and standard deviation for each non-reference level as well as the results of t-tests comparing each level against zero (an asterisk in the "sig" column indicates the test was significant at the given adjusted alpha):

Level	Mean	SD	t	df	Sig (α_{Bonf} = .0167)
Up to 3 small devices	0.3797	0.1947	68.31	1226	*
One medium device	0.4865	0.1819	93.71	1226	*
One medium and up to 3 small devices	0.6014	0.1855	113.55	1226	*

An ANOVA revealed a main effect of attribute level, $F(2, 2438) = 420.15$, $p < .001$. Post hoc testing showed that all pairwise differences among levels were significantly different. There were no other main effects or interactions.

Privacy in Billets

This attribute addressed the level of privacy Soldiers could expect in their billets. The levels of this attribute were:

- None – open bay (reference)
- Privacy screen
- Walls

The following table presents the mean and standard deviation for each non-reference level as well as the results of t-tests comparing each level against zero (an asterisk in the "sig" column indicates the test was significant at the given adjusted alpha):

Level	Mean	SD	t	df	Sig (α_{Bonf} = .025)
Privacy screen	0.3530	0.1815	68.12	1226	*
Walls	0.5974	0.1926	108.62	1226	*

An ANOVA revealed a main effect of attribute level, $F(1, 1219) = 1077.32$, $p < .001$. Post hoc testing showed that all pairwise differences among levels were significantly different. There were no other main effects or interactions.

Noise Level in Billets

This attribute addressed the level of ambient noise that Soldiers could encounter in their billets. The levels of this attribute were:

- 85 dB (reference)
- 75 dB
- 65 dB
- 55 dB
- 45 dB

The following table presents the mean and standard deviation for each non-reference level as well as the results of t-tests comparing each level against zero (an asterisk in the "sig" column indicates the test was significant at the given adjusted alpha):

Level	Mean	SD	t	df	Sig (α_{Bonf} = .0125)
75 dB	0.2215	0.1695	45.77	1226	*
65 dB	0.3972	0.1702	81.73	1226	*
55 dB	0.5190	0.1810	100.43	1226	*
45 dB	0.5033	0.1715	102.78	1226	*

An ANOVA revealed a main effect of attribute level, $F(3, 3657) = 736.78$, $p < .001$. Post hoc testing showed that all pairwise differences among levels were significantly different, except for the two most preferred levels (45 vs. 55 dB). There were no other main effects or interactions.

Overhead Lighting in Billets

This attribute addressed the kind of overhead lighting available to Soldiers in base camp billets. The levels of this attribute were:

- None (reference)
- Blackout lights only
- Overhead light bank controlled with a single switch
- Overhead light bank with independent zones controlled by separate switches

The following table presents the mean and standard deviation for each non-reference level as well as the results of t-tests comparing each level against zero (an asterisk in the "sig" column indicates the test was significant at the given adjusted alpha):

Level	Mean	SD	t	df	Sig (α_{Bonf} = .0167)
Blackout lights	0.2170	0.1799	42.26	1226	*
Overhead lights, one switch	0.4329	0.1771	85.61	1226	*
Overhead lights, multiple switches	0.5057	0.1818	97.42	1226	*

An ANOVA revealed a main effect of attribute level, $F(2, 2438) = 844.62$, $p < .001$. Post hoc testing showed that all pairwise differences among levels were significantly different. There were no other main effects or interactions.

Flooring in Billets

This attribute addressed the kind of flooring Soldiers might have in their billets. The levels of this attribute were:

- Bare ground (reference)
- Tarp or other flexible flooring
- Rigid flooring
- Insulated rigid flooring
- Heated flooring

The following table presents the mean and standard deviation for each non-reference level as well as the results of t-tests comparing each level against zero (an asterisk in the "sig" column indicates the test was significant at the given adjusted alpha):

Level	Mean	SD	t	df	Sig (α_{Bonf} = .0125)
Flexible	0.2592	0.1758	51.63	1226	*
Rigid	0.4115	0.1775	81.19	1226	*
Insulated rigid	0.4393	0.1830	84.06	1226	*
Heated	0.4742	0.1771	93.77	1226	*

An ANOVA revealed a main effect of attribute level, $F(3, 3657) = 336.80$, $p < .001$. Post hoc testing showed that all pairwise differences among levels were significantly different. There were no other main effects or interactions.

Ventilation in Billets

This attribute addressed the kind of ventilation that Soldiers could encounter in their billets. The levels of this attribute were:

- Doors opening and closing (reference)
- Windows
- Windows and fans
- Windows and fans with an air filtration system

The following table presents the mean and standard deviation for each non-reference level as well as the results of t-tests comparing each level against zero (an asterisk in the "sig" column indicates the test was significant at the given adjusted alpha):

Level	Mean	SD	t	df	Sig (α_{Bonf} = .0167)
Windows	0.0337	0.1834	6.45	1226	*
Windows and fans	0.3788	0.1749	75.86	1226	*
Windows and fans with air filtration	0.4509	0.1886	83.73	1226	*

An ANOVA revealed a main effect of attribute level, $F(2, 2438) = 1802.24$, $p < .001$. Post hoc testing showed that all pairwise differences among levels were significantly different. There were no other main effects or interactions.

Personal Storage in Billets

This attribute addressed the amount of storage Soldiers might have in their billets for storing personal items. The levels of this attribute were:

- None (reference)
- Duffel bag
- Wall locker
- Wall locker with three-drawer chest

The following table presents the mean and standard deviation for each non-reference level as well as the results of t-tests comparing each level against zero (an asterisk in the "sig" column indicates the test was significant at the given adjusted alpha):

Level	Mean	SD	t	df	Sig (α_{Bonf} = .0167)
Duffel bag	0.1101	0.1809	21.30	1226	*
Wall locker	0.3058	0.1855	57.73	1226	*
Wall locker with three door chest	0.4391	0.1899	80.95	1226	*

An ANOVA revealed a main effect of attribute level, $F(2, 2438) = 945.70$, $p < .001$. Post hoc testing showed that all pairwise differences among levels were significantly different. There were no other main effects or interactions.

Area per Soldier in Living Space

This attribute addressed the amount of square footage each Soldiers could have to him/herself in his/her billets. The levels of this attribute were:

- 50 square feet (reference)
- 80 square feet
- 110 square feet

The following table presents the mean and standard deviation for each non-reference level as well as the results of t-tests comparing each level against zero (an asterisk in the "sig" column indicates the test was significant at the given adjusted alpha):

Level	Mean	SD	t	df	Sig (α_{Bonf} = .025)
80 square feet	0.2677	0.1875	50.01	1226	*
110 square feet	0.4270	0.1961	76.27	1226	*

An ANOVA revealed a main effect of attribute level, $F(1, 1219) = 435.60$, $p < .001$. Post hoc testing showed that all pairwise differences among levels were significantly different. There were no other main effects or interactions.

Humidity in Billets

This attribute addressed the humidity level in base camp billets. The levels of this attribute were:

- 70% - damp/humid air (reference)
- 50% - average
- 30% - dry air

The following table presents the mean and standard deviation for each non-reference level as well as the results of t-tests comparing each level against zero (an asterisk in the "sig" column indicates the test was significant at the given adjusted alpha):

Level	Mean	SD	t	df	Sig (α_{Bonf} = .025)
50%	0.3460	0.1900	63.78	1226	*
30%	0.3733	0.1849	70.38	1226	*

An ANOVA revealed a main effect of attribute level, $F(1, 1219) = 12.67$, $p < .001$. Post hoc testing showed that all pairwise differences among levels were significantly different. In addition, there was a main effect of MOS, $F(1, 1219) = 5.55$, $p < .05$. Soldiers in support MOS cared more about the humidity level in their billets ($M = 0.3697$, $SD = 0.1907$) than Soldiers in combat MOS ($M = 0.3531$, $SD = 0.1858$). There were no other main effects or interactions.

Ability to Control Temperature in Billets

This attribute addressed the ability of Soldiers to control the temperature in their billets. The levels of this attribute were:

- No – set by SOP (reference)
- Yes

The following table presents the mean and standard deviation for each non-reference level as well as the results of t-tests comparing each level against zero (an asterisk in the "sig" column indicates the test was significant at the given adjusted alpha):

Level	Mean	SD	t	df	Sig ($\alpha_{Bonf} = .05$)
Yes	0.3443	0.2036	59.24	1226	*

An ANOVA revealed a main effect of gender, $F(1, 1219) = 5.98$, $p < .05$. Male Soldiers cared more about being able to control the temperature in their billets ($M = 0.3473$, $SD = .2041$) than female Soldiers ($M = 0.2768$, $SD = 0.1816$). There were no other main effects or interactions.

Building material of billets

This attribute addressed the construction materials and overall structure used in base camp billets. The levels of this attribute were:

- Soft walled (reference)
- Rigid walled
- Hybrid
- Hard stand building

The following table presents the mean and standard deviation for each non-reference level as well as the results of t-tests comparing each level against zero (an asterisk in the "sig" column indicates the test was significant at the given adjusted alpha):

Level	Mean	SD	t	df	Sig ($\alpha_{Bonf} = .0167$)
Rigid walled	0.0783	0.1871	14.68	1226	*
Hybrid	0.2249	0.1779	44.29	1226	*
Hard stand	0.3136	0.1859	59.12	1226	*

An ANOVA revealed a main effect of attribute level, $F(2, 2438) = 497.49$, $p < .001$. Post hoc testing showed that all pairwise differences among levels were significantly different. There were no other main effects or interactions.

Field Hygiene

Shower Frequency

This attribute addressed how often Soldiers would be able to shower. The levels of this attribute were:

- Once every 4 weeks (reference)
- Once every 3 weeks
- Once every 2 weeks
- Once per week
- Every day
- Twice or more per day

The following table presents the mean and standard deviation for each non-reference level as well as the results of t-tests comparing each level against zero (an asterisk in the "sig" column indicates the test was significant at the given adjusted alpha):

Level	Mean	SD	t	df	sig (α_{Bonf} = .01)
Once every 3 weeks	0.1917	0.1749	38.40	1226	*
Once every 2 weeks	0.3919	0.1759	78.00	1226	*
Once per week	0.5768	0.1878	107.60	1226	*
Once per day	0.9673	0.1738	194.95	1226	*
Two or more timers per day	0.9415	0.1789	184.25	1226	*

An ANOVA revealed a main effect of attribute level, $F(4, 4876) = 4335.26$, $p < .001$. Post hoc testing showed that all pairwise differences among levels were significantly different. In addition, there was an interaction between level and rank, $F(8, 4876) = 2.15$, $p < .05$. As shown in Figure C-7, this interaction was driven by the result that junior enlisted were less averse to showering only once every 3 weeks compared with senior enlisted or officers. There were no other main effects or interactions.

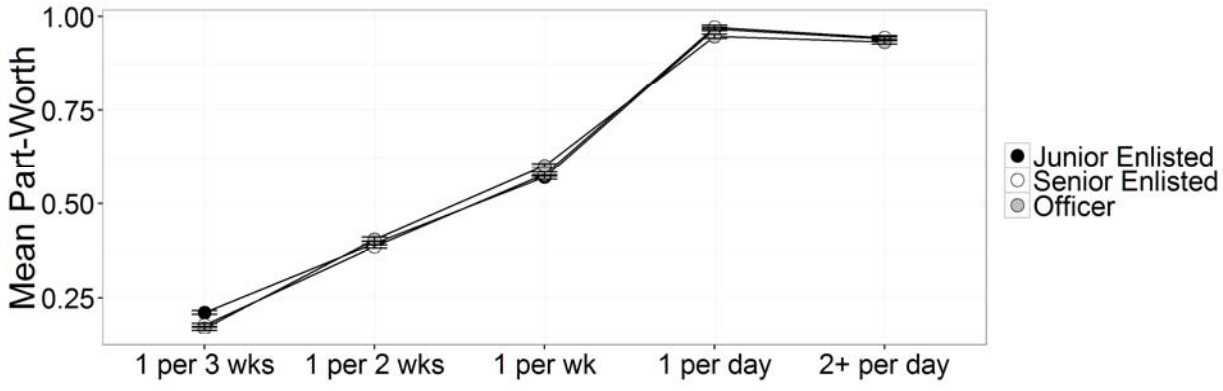


Figure C-7. Interaction between shower frequency and rank. Error bars represent plus and minus one standard error.

Type of Latrine

This attribute addressed the type of latrines available to Soldiers on a base camp. The levels of this attribute were:

- Urination tubes and straddle trenches (reference)
- Urination tubes and burnout latrines
- Portable, non-flush toilets
- Flush toilets

The following table presents the mean and standard deviation for each non-reference level as well as the results of t-tests comparing each level against zero (an asterisk in the "sig" column indicates the test was significant at the given adjusted alpha):

Level	Mean	SD	t	df	sig (α_{Bonf} = .0167)
Urination tubes and burnout latrines	0.0235	0.1760	4.69	1226	*
Portable, non-flush toilets	0.2871	0.1791	56.14	1226	*
Flush toilets	0.6205	0.1795	121.08	1226	*

An ANOVA revealed a main effect of attribute level, $F(2, 2438) = 3330.35$, $p < .001$. Post hoc testing showed that the pairwise differences between levels were significantly different. There were no other main effects or interactions.

Shower Structure

This attribute addressed the kind of shower structure present on a base camp. The levels of this attribute were:

- Improvised with no privacy (reference)
- Improvised with privacy
- Shower system with privacy

The following table presents the mean and standard deviation for each non-reference level as well as the results of t-tests comparing each level against zero (an asterisk in the "sig" column indicates the test was significant at the given adjusted alpha):

Level	Mean	SD	t	df	sig (α_{Bonf} = .025)
Improvised with no privacy	0.4215	0.1877	78.65	1226	*
Shower system with privacy	0.6099	0.1889	113.06	1226	*

An ANOVA revealed a main effect of attribute level, $F(1, 1219) = 593.90$, $p < .001$. Post hoc testing showed that all pairwise differences among levels were significantly different. In addition, there was an interaction between level and camp experience, $F(2, 1219) = 3.07$, $p < .05$. As shown in Figure C-8, Soldiers who spent most of their time on camps housing 50 or fewer personnel had a lower preference than other Soldiers for an improvised shower system. Conversely, Soldiers with the most experience with these very small camps had a greater preference for having a shower system. Finally, there was a main effect of work location, F(1,

1219) = 14.02, p < .01. Soldiers who worked primarily inside their base had a greater preference for a shower structure that afforded some level of privacy (M = 0.5293, SD = 0.2065) than Soldiers who primarily worked outside the camp (M = 0.5039, SD = 0.2135). There were no other main effects or interactions.

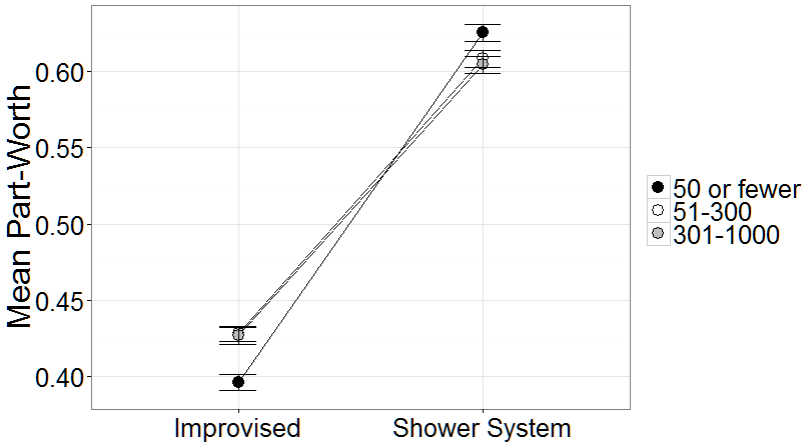


Figure C-8. Interaction between shower structure level and camp experience. Error bars represent plus and minus one standard error.

Person Doing Laundry

This attribute addressed who would be responsible for doing laundry on a base camp and, if it is the individual Soldier, what kind of laundry facilities would be available. The levels of this attribute were:

- Individual hand wash and air dry (reference)
- Individual machine wash, air dry
- Individual machine wash and dry
- Batch laundry with a 3 day turnaround
- Batch laundry with a 7 day turnaround

The following table presents the mean and standard deviation for each non-reference level as well as the results of t-tests comparing each level against zero (an asterisk in the "sig" column indicates the test was significant at the given adjusted alpha):

Level	Mean	SD	t	df	sig (α_{Bonf} = .0125)
Individual machine wash, air dry	0.3453	0.1756	68.86	1226	*
Individual machine wash and dry	0.4891	0.1739	98.52	1226	*
Turn-in, 3-day turnaround	0.4173	0.1809	80.81	1226	*
Turn-in, 7-day turnaround	0.1842	0.1785	36.15	1226	*

An ANOVA revealed a main effect of attribute level, F(3, 3657) = 628.09, p <.001. Post hoc testing showed that all pairwise differences among levels were significantly different. There were no other main effects or interactions.

Shower Duration

This attribute addressed how long Soldiers would be able to shower. The levels of this attribute were:

- 2 min (reference)
- 5 min or less
- 10 min or less
- 15 min or less

The following table presents the mean and standard deviation for each non-reference level as well as the results of t-tests comparing each level against zero (an asterisk in the "sig" column indicates the test was significant at the given adjusted alpha):

Level	Mean	SD	t	df	sig (α_{Bonf} = .0167)
5 minutes	0.2779	0.1888	51.56	1226	*
10 minutes	0.4557	0.1772	90.07	1226	*
15 minutes	0.4794	0.1885	89.09	1226	*

An ANOVA revealed a main effect of attribute level, $F(2, 2438) = 433.74$, $p < .001$. Post hoc testing showed that all pairwise differences among levels were significantly different. There were no other main effects or interactions.

Shower Flow Rate

This attribute addressed the flow rate that could be expected within a base camp shower system. The levels of this attribute were:

- Gravity fed (reference)
- Pressure fed

The following table presents the mean and standard deviation for each non-reference level as well as the results of t-tests comparing each level against zero (an asterisk in the "sig" column indicates the test was significant at the given adjusted alpha):

Level	Mean	SD	t	df	sig (α_{Bonf} = .05)
Pressure fed	0.4718	0.1987	83.19	1226	*

There were no main effects of any of the demographic variables (i.e., gender, MOS, rank, primary work location, or primary camp experience).

Ability to Control Shower Water Temperature

This attribute addressed how much control Soldiers would have over shower water temperature. The levels of this attribute were:

- None (reference)
- Some – cool to lukewarm
- Full – cool to hot

The following table presents the mean and standard deviation for each non-reference level as well as the results of t-tests comparing each level against zero (an asterisk in the "sig" column indicates the test was significant at the given adjusted alpha):

Level	Mean	SD	t	df	sig (α_{Bonf} = .025)
Cool to lukewarm	0.2766	0.1867	51.89	1226	*
Cool to hot	0.4685	0.1981	82.82	1226	*

An ANOVA revealed a main effect of attribute level, $F(1, 1219) = 625.38$, $p < .001$. Post hoc testing showed that all pairwise differences among levels were significantly different. In addition, there was an interaction between level and primary work location, $F(1, 1219) = 7.26$, $p < .01$. As shown in Figure C-9, Soldiers who worked primarily inside the wire placed a higher value on full shower water temperature control than Soldiers who worked primarily outside the wire. However, both groups of Soldiers had a similar preference for partial temperature control. There were no other main effects or interactions.

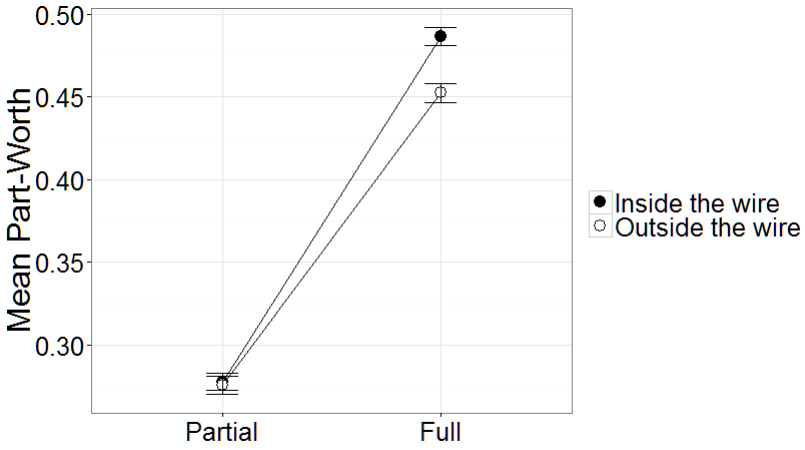


Figure C-9. Interaction between shower water temperature control level and primary work location. Error bars represent plus and minus one standard error.

OCIE Washing Capability

This attribute addressed whether Soldiers can wash bulky organizational clothing and individual equipment (OCIE) such as sleeping bags, poncho liners, and cold weather gear. The levels of this attribute were:

- Individual hand wash and air dry (reference)
- Individual machine wash, air dry
- Individual machine wash and dry
- Batch laundry with a 3-day turnaround
- Batch laundry with a 7-day turnaround

The following table presents the mean and standard deviation for each non-reference level as well as the results of t-tests comparing each level against zero (an asterisk in the "sig" column indicates the test was significant at the given adjusted alpha):

Level	Mean	SD	t	df	sig (α_{Bonf} = .0125)
Individual machine wash, air dry	0.3400	0.1803	66.05	1226	*
Individual machine wash and dry	0.3869	0.1789	75.74	1226	*
Turn-in, 3-day turnaround	0.3217	0.1827	61.67	1226	*
Turn-in, 7-day turnaround	0.1109	0.1781	21.81	1226	*

An ANOVA revealed a main effect of attribute level, $F(3, 3657) = 554.30$, $p < .001$. Post hoc testing showed that all pairwise differences among levels were significantly different except the difference between individual machine was/air dry and batch laundry with a 3-day turnaround. In addition, there was a main effect of rank, $F(2, 1219) = 4.52$, $p < .05$. Post hoc testing showed that officers cared more about OCIE washing capabilities ($M = 0.3118$, $SD = 0.2049$) than junior enlisted ($M = 0.2871$, $SD = 0.2137$). However, neither officer nor junior enlisted differed statistically from senior enlisted ($M = 0.2877$, $SD = 0.2044$). There were no other main effects or interactions.

Ventilation in Latrines

This attribute addressed the kind of ventilation available in base camp latrines. The levels of this attribute were:

- Doors opening and closing
- Windows
- Windows and fans
- Windows and fans with an air filtration system

The following table presents the mean and standard deviation for each non-reference level as well as the results of t-tests comparing each level against zero (an asterisk in the "sig" column indicates the test was significant at the given adjusted alpha):

Level	Mean	SD	t	df	sig (α_{Bonf} = .0167)
Windows	0.1146	0.1831	21.92	1226	*
Windows and fans	0.3682	0.1792	71.93	1226	*
Windows and fans with air filtration	0.3600	0.1777	70.98	1226	*

An ANOVA revealed a main effect of attribute level, $F(2, 2438) = 743.23$, $p < .001$. Post hoc testing showed that all pairwise differences among levels were significantly different. In addition, there was an interaction between level and rank, $F(4, 2438) = 3.16$, $p < .05$. As shown in Figure C-10, junior and senior enlisted had a similar preference pattern: windows were the least preferred option, followed by windows and fans and windows and fans with air filtration. Officers, however, had a relatively higher preference for windows and fans, and, conversely, a relatively lower preference for adding air filtration. It is unclear what may have driven this difference between officers and enlisted Soldiers. There were no other main effects or interactions.

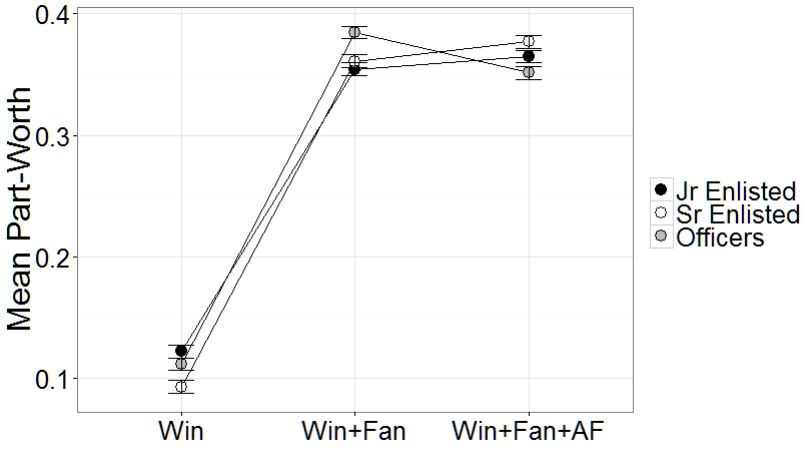


Figure C-10. Interaction between latrine ventilation level and rank. Win = windows, AF = air filtration. Error bars represent plus and minus on standard error.

HVAC in Latrines

This attribute addressed whether base camp latrines had HVAC climate control. The levels of this attribute were:

- No (reference)
- Yes

The following table presents the mean and standard deviation for each non-reference level as well as the results of t-tests comparing each level against zero (an asterisk in the "sig" column indicates the test was significant at the given adjusted alpha):

Level	Mean	SD	t	df	sig (α_{Bonf} = .05)
Yes	0.3665	0.2066	62.15	1226	*

An ANOVA revealed a main effect of work location, F(1, 1219) = 7.06, p <.01. Soldiers who worked primarily inside the wire cared more about having HVAC in their latrines (M = 0.3819, SD = 0.2050) than Soldiers who worked primarily outside the wire (M = 0.3532, SD = 0.1982). There were no other main effects or interactions.

Water for Shaving

This attribute addressed the kind of access Soldiers would have to water for shaving. The levels of this attribute were:

- Hand wash station with bottled water (reference)
- Running water with no temperature control
- Running water with temperature control

The following table presents the mean and standard deviation for each non-reference level as well as the results of t-tests comparing each level against zero (an asterisk in the "sig" column indicates the test was significant at the given adjusted alpha):

Level	Mean	SD	t	df	sig (α_{Bonf} = .025)
Running water, no temperature control	0.1661	0.1837	31.69	1226	*
Running water with temperature control	0.3565	0.1835	68.07	1226	*

An ANOVA revealed a main effect of attribute level, F(1, 1219) = 655.48, p <.001. Post hoc testing showed that all pairwise differences among levels were significantly different. In addition, there was a main effect of work location, F(1, 1219) = 4.32, p < .05. Soldiers who worked primarily inside the wire cared more about water for hand-washing (M = 0.2670, SD = 0.2039) than Soldiers in combat MOS (M = 0.2564, SD = 0.2091). There were no other main effects or interactions.

Water for Hand-Washing

This attribute addressed the kind of access Soldier would have to water for hand washing. The levels of this attribute were:

- Hand wash station with bottled water (reference)
- Running water with no temperature control
- Running water with temperature control

The following table presents the mean and standard deviation for each non-reference level as well as the results of t-tests comparing each level against zero (an asterisk in the "sig" column indicates the test was significant at the given adjusted alpha):

Level	Mean	SD	t	df	sig (α_{Bonf} = .025)
Running water, no temperature control	0.0388	0.1837	7.39	1226	*
Running water with temperature control	0.2981	0.1821	57.36	1226	*

An ANOVA revealed a main effect of attribute level, F(1, 1219) = 1298.64, p <.001. Post hoc testing showed that all pairwise differences among levels were significantly different. In addition, there was a main effect of MOS, F(1, 1219) = 10.26, p < .01. Soldiers in support MOS cared more about water for hand-washing (M = 0.1821, SD = 0.2222) than Soldiers in combat MOS (M = 0.1596, SD = 0.2251). There were no other main effects or interactions.

Water for Toothbrushing

This attribute addressed the kind of access a Soldier would have to water for brushing his or her teeth. The levels of this attribute were:

- Hand wash station with bottled water (reference)
- Running water with no temperature control
- Running water with temperature control

The following table presents the mean and standard deviation for each non-reference level as well as the results of t-tests comparing each level against zero (an asterisk in the "sig" column indicates the test was significant at the given adjusted alpha):

Level	Mean	SD	t	df	sig (α_{Bonf} = .025)
Running water, no temperature control	0.0365	0.1832	6.98	1226	*
Running water with temperature control	0.2047	0.1876	38.23	1226	*

An ANOVA revealed a main effect of attribute level, F(1, 1219) = 515.12, p <.001. Post hoc testing showed that all pairwise differences among levels were significantly different. There were no other main effects or interactions.

Bags of Laundry that Can Be Done at One Time

This attribute addressed how much laundry a Soldier could do each time he or she used laundry capabilities. The levels of this attribute were:

- One (reference)
- Two
- Three

The following table presents the mean and standard deviation for each non-reference level as well as the results of t-tests comparing each level against zero (an asterisk in the "sig" column indicates the test was significant at the given adjusted alpha):

Level	Mean	SD	t	df	sig (α_{Bonf} = .025)
Two	0.1177	0.1889	21.82	1226	*
Three	0.1454	0.1866	27.29	1226	*

An ANOVA revealed a main effect of attribute level, F(1, 1219) = 13.34, p <.001. Post hoc testing showed that the pairwise differences between levels were significantly different. In addition, there was a main effect of MOS, F(1, 1219) = 5.07, p < .05. Soldiers in support MOS

preferred being able to do more than one bag of laundry more than Soldiers in combat MOS, M = 0.1428 (SD = 0.1896) vs M = 0.1242 (SD = 0.1871), respectively. There were no other main effects or interactions.

Morale, Welfare, and Recreation (MWR)

PX/AAFES Goods

This attribute addressed the range of goods that Soldiers might be able to find at a base camp PX/AAFES. The levels of this attribute were:

- None (reference)
- Basic health, hygiene, and personal care (HHPC) items only
- HHPC plus unrefrigerated snacks and beverages
- HHPC plus both refrigerated and unrefrigerated snacks and beverages

The following table presents the mean and standard deviation for each non-reference level as well as the results of t-tests comparing each level against zero (an asterisk in the "sig" column indicates the test was significant at the given adjusted alpha):

Level	Mean	SD	t	df	Sig (α_{Bonf} = .0167)
HHPC only	0.3951	0.1693	81.73	1226	*
HHPC plus unrefrigerated snacks/bev	0.6125	0.1821	117.82	1226	*
HHPC plus refrigerated snacks/bev	0.7641	0.1778	150.55	1226	*

An ANOVA revealed a main effect of attribute level, $F(2, 2438) = 1306.19$, $p < .001$. Post hoc testing showed that all pairwise differences among levels were significantly different. There were no other main effects or interactions.

SPAWAR/NIPR Computers

This attribute addressed how many SPAWAR/NIPR computers Soldiers could access for personal use as part of a base camp's MWR capabilities. The levels of this attribute were:

- None (reference)
- 1 for every 50 Soldiers
- 1 for every 10 Soldiers
- Personal computer/laptop

The following table presents the mean and standard deviation for each non-reference level as well as the results of t-tests comparing each level against zero (an asterisk in the "sig" column indicates the test was significant at the given adjusted alpha):

Level	Mean	SD	t	df	Sig (α_{Bonf} = .0167)
1 computer/50 Soldiers	0. 1907	0.1839	36.33	1226	*
1 computer/10 Soldiers	0. 4456	0.1851	84.34	1226	*
Personal computer	0.6774	0.1862	127.43	1226	*

An ANOVA revealed a main effect of attribute level, $F(2, 2438) = 2088.00$, $p < .001$. Post hoc testing showed that all pairwise differences among levels were significantly different. There were no other main effects or interactions.

Access to Weights

This attribute addressed whether Soldiers would be able to access weights as part of a base camp gym facility. The levels of this attribute were:

- None (reference)
- Dumbbells only
- Dumbbells and barbells
- Resistance/weight machines

The following table presents the mean and standard deviation for each non-reference level as well as the results of t-tests comparing each level against zero (an asterisk in the "sig" column indicates the test was significant at the given adjusted alpha):

Level	Mean	SD	t	df	Sig ($\alpha_{Bonf} = .0167$)
Dumbbells	0.2406	0.1810	46.56	1226	*
Dumbbells and barbells	0.6563	0.1888	121.73	1226	*
Resistance/weight machines	0.5264	0.1854	99.43	1226	*

An ANOVA revealed a main effect of attribute level, $F(2, 2438) = 1605.64$, $p < .001$. Post hoc testing showed that all pairwise differences among levels were significantly different. In addition, there was a main effect of MOS, $F(1, 1219) = 4.64$, $p < .05$. Soldiers in combat MOS cared more about access to weights ($M = 0.4802$, $SD = 0.2547$) than Soldiers in support MOS ($M = 0.4656$, $SD = 0.2522$). There were no other main effects or interactions.

SPAWAR/NIPR Telephones

This attribute addressed how many SPAWAR/NIPR telephones Soldiers could access for personal use as part of a base camp's MWR capabilities. The levels of this attribute were:

- Phone only available for emergency personal calls (reference)
- Phone bank with 1 phone for every 100 Soldiers
- Phone bank with 1 phone for every 50 Soldiers
- Phone bank with 1 phone for every 20 Soldiers
- Personal cell phone

The following table presents the mean and standard deviation for each non-reference level as well as the results of t-tests comparing each level against zero (an asterisk in the "sig" column indicates the test was significant at the given adjusted alpha):

Level	Mean	SD	t	df	Sig (α_{Bonf} = .0125)
1 phone/100 Soldiers	0.2899	0.1814	55.97	1226	*
1 phone/50 Soldiers	0.3544	0.1769	70.14	1226	*
1 phone/ 20 Soldiers	0.4516	0.1777	88.99	1226	*
Personal cell phone	0.6188	0.1803	120.20	1226	*

An ANOVA revealed a main effect of attribute level, $F(3, 3657) = 751.48$, $p < .001$. Post hoc testing showed that all pairwise differences among levels were significantly different. There were no other main effects or interactions.

Gym Area

This attribute addressed the kind of gym facility that might be present on a base camp. The levels of this attribute were:

- No dedicated space (reference)
- Tent/shelter with no HVAC
- Tent/shelter with HVAC

The following table presents the mean and standard deviation for each non-reference level as well as the results of t-tests comparing each level against zero (an asterisk in the "sig" column indicates the test was significant at the given adjusted alpha):

Level	Mean	SD	t	df	Sig (α_{Bonf} = .025)
Tent/shelter with no HVAC	0.3309	0.1786	64.91	1226	*
Tent/shelter with HVAC	0.5902	0.1834	112.73	1226	*

An ANOVA revealed a main effect of attribute level, $F(1, 1219) = 1155.03$, $p < .001$. Post hoc testing showed that all pairwise differences among levels were significantly different. There were no other main effects or interactions.

WiFi in Billets

This attribute addressed whether WiFi is available in the billets. The levels of this attribute were:

- No (reference)
- Yes

The following table presents the mean and standard deviation for each non-reference level as well as the results of t-tests comparing each level against zero (an asterisk in the "sig" column indicates the test was significant at the given adjusted alpha):

Level	Mean	SD	t	df	Sig (α_{Bonf} = .05)
Yes	0.5708	0.2222	89.96	1226	*

There were no main effects involving demographic variables.

Temperature in MWR Area

This attribute addressed the temperature in a base camp MWR facility. The levels of this attribute were:

- 90 °F (reference)
- 80 °F
- 60 °F
- 60 °F
- 50 °F

The following table presents the mean and standard deviation for each non-reference level as well as the results of t-tests comparing each level against zero (an asterisk in the "sig" column indicates the test was significant at the given adjusted alpha):

Level	Mean	SD	t	df	Sig (α_{Bonf} = .0125)
80 °F	0.2244	0.1737	45.25	1226	*
70 °F	0.4293	0.1766	85.15	1226	*
60 °F	0.5562	0.1776	109.68	1226	*
50 °F	0.4754	0.1761	94.56	1226	*

An ANOVA revealed a main effect of attribute level, $F(3, 3657) = 776.08$, $p < .001$. Post hoc testing showed that all pairwise differences among levels were significantly different. There were no other main effects or interactions.

Convenience Power in MWR Area

This attribute addressed whether Soldiers would have power to charge personal electronic devices in a base camp MWR facility. The levels of this attribute were:

- None (reference)
- Enough to power up to three small devices such as a cell phone
- Enough to power one medium device such as a laptop computer
- Enough to power one medium device and up to three small devices

The following table presents the mean and standard deviation for each non-reference level as well as the results of t-tests comparing each level against zero (an asterisk in the "sig" column indicates the test was significant at the given adjusted alpha):

Level	Mean	SD	t	df	Sig (α_{Bonf} = .0167)
Up to 3 small devices	0.3863	0.1772	76.37	1226	*
1 medium device	0.3015	0.1757	60.10	1226	*
1 medium device and up to 3 small devices	0.5221	0.1747	104.72	1226	*

An ANOVA revealed a main effect of attribute level, $F(2, 2438) = 480.63$, $p < .001$. Post hoc testing showed that all pairwise differences among levels were significantly different. There were no other main effects or interactions.

Access to Video Chat

This attribute addressed whether Soldiers would have access to video chat services such as Skype to communicate with friends and family back home. The levels of this attribute were:

- No (reference)
- Yes

The following table presents the mean and standard deviation for each non-reference level as well as the results of t-tests comparing each level against zero (an asterisk in the "sig" column indicates the test was significant at the given adjusted alpha):

Level	Mean	SD	t	df	Sig ($\alpha_{Bonf} = .05$)
Yes	0.5141	0.2059	87.47	1226	*

There were no main effects involving demographic variables.

PX/AAFES Type

This attribute addressed the kind of PX/AAFES services that a base camp provides. The levels of this attribute were:

- None – purchasing off the local economy only (reference)
- Mobile PX
- On-site PX/AAFES

The following table presents the mean and standard deviation for each non-reference level as well as the results of t-tests comparing each level against zero (an asterisk in the "sig" column indicates the test was significant at the given adjusted alpha):

Level	Mean	SD	t	df	Sig ($\alpha_{Bonf} = .025$)
Mobile PX	0.3476	0.1867	65.24	1226	*
On-site PX	0.4803	0.1897	88.68	1226	*

An ANOVA revealed a main effect of attribute level, $F(1, 1219) = 323.06$, $p < .001$.There were no other main effects or interactions.

Mail Frequency

This attribute addressed how often Soldiers could expect to receive letters through the mail. The levels of this attribute were:

- Once a month (reference)
- Twice a month

- Every 7 days
- Every 3 days
- Every day

The following table presents the mean and standard deviation for each non-reference level as well as the results of t-tests comparing each level against zero (an asterisk in the "sig" column indicates the test was significant at the given adjusted alpha):

Level	Mean	SD	t	df	Sig (α_{Bonf} = .0125)
Twice a month	0.1997	0.1781	39.26	1226	*
Every 7 days	0.3844	0.1745	77.18	1226	*
Every 3 days	0.4721	0.1729	95.60	1226	*
Every day	0.4307	0.1770	85.22	1226	*

An ANOVA revealed a main effect of attribute level, $F(3, 3657) = 558.51$, $p < .001$. Post hoc testing showed that all pairwise differences among levels were significantly different. There were no other main effects or interactions.

Access to Cardio Equipment

This attribute addressed whether Soldiers would be able to access cardio equipment as part of a base camp gym facility. The levels of this attribute were:

- None (reference)
- 1 for every 50 Soldiers - 30 min per day
- 1 for every 150 Soldiers - 30 min twice a week
- 1 for every 300 Soldiers - 30 min once per week

The following table presents the mean and standard deviation for each non-reference level as well as the results of t-tests comparing each level against zero (an asterisk in the "sig" column indicates the test was significant at the given adjusted alpha):

Level	Mean	SD	t	df	Sig (α_{Bonf} = .0167)
1 for every 300 Soldiers	0.0466	0.1829	8.92	1226	*
1 for every 150 Soldiers	0.3076	0.1827	59.98	1226	*
1 for every 50 Soldiers	0.4651	0.1866	87.34	1226	*

An ANOVA revealed a main effect of attribute level, $F(2, 2438) = 1566.58$, $p < .001$. Post hoc testing showed that all pairwise differences among levels were significantly different. There were no other main effects or interactions.

MWR Area

This attribute addressed the kind of MWR facility that might be present on a base camp. The levels of this attribute were:

- No dedicated space (reference)
- Tent/shelter with no HVAC
- Tent/shelter with HVAC

The following table presents the mean and standard deviation for each non-reference level as well as the results of t-tests comparing each level against zero (an asterisk in the "sig" column indicates the test was significant at the given adjusted alpha):

Level	Mean	SD	t	df	Sig (α_{Bonf} = .025)
Tent/shelter with no HVAC	0.1777	0.1819	34.22	1226	*
Tent/shelter with HVAC	0.4385	0.1921	79.98	1226	*

An ANOVA revealed a main effect of attribute level, $F(1, 1219) = 1176.06$, $p < .001$. Post hoc testing showed that all pairwise differences among levels were significantly different. There were no other main effects or interactions.

Gym Temperature

This attribute addressed the temperature in a base camp gym. The levels of this attribute were:

- 50 °F
- 60 °F
- 70 °F
- 80 °F
- 90 °F (reference)

The following table presents the mean and standard deviation for each non-reference level as well as the results of t-tests comparing each level against zero (an asterisk in the "sig" column indicates the test was significant at the given adjusted alpha):

Level	Mean	SD	t	df	Sig (α_{Bonf} = .0125)
80 °F	0.1276	0.1844	24.24	1226	*
70 °F	0.3634	0.1752	72.65	1226	*
60 °F	0.3304	0.1837	63.03	1226	*
50 °F	0.4346	0.1842	82.65	1226	*

An ANOVA revealed a main effect of attribute level, $F(3, 3657) = 623.98$, $p < .001$. Post hoc testing showed that all pairwise differences among levels were significantly different. There were no other main effects or interactions.

WiFi in MWR Area

This attribute addressed whether WiFi is available in a base camp MWR facility. The levels of this attribute were:

- No (reference)
- Yes

The following table presents the mean and standard deviation for each non-reference level as well as the results of t-tests comparing each level against zero (an asterisk in the "sig" column indicates the test was significant at the given adjusted alpha):

Level	Mean	SD	t	df	Sig (α_{Bonf} = .05)
Yes	0.4309	0.2011	75.02	1226	*

There were no main effects involving demographic variables.

MWR Ventilation

This attribute addressed the kind of ventilation present in a base camp MWR facility. The levels of this attribute were:

- Doors opening and closing (reference)
- Windows
- Windows and fans
- Windows and fans with an air filtration system

The following table presents the mean and standard deviation for each non-reference level as well as the results of t-tests comparing each level against zero (an asterisk in the "sig" column indicates the test was significant at the given adjusted alpha):

Level	Mean	SD	t	df	Sig (α_{Bonf} = .0167)
Windows	0.1064	0.1799	20.71	1226	*
Windows and fans	0.2047	0.1849	38.79	1226	*
Windows and fans with air filtration	0.3628	0.1811	70.15	1226	*

An ANOVA revealed a main effect of attribute level, $F(2, 2438) = 613.27$, $p < .001$. Post hoc testing showed that all pairwise differences among levels were significantly different. There were no other main effects or interactions.

Access to Reading Material and Games

This attribute addressed whether Soldiers would have access to reading material, including magazines and books, as well as card and/or board games. The levels of this attribute were:

- None (reference)
- Older books and magazines and a few common board games
- Current books and magazines and a range of board games

The following table presents the mean and standard deviation for each non-reference level as well as the results of t-tests comparing each level against zero (an asterisk in the "sig" column indicates the test was significant at the given adjusted alpha):

Level	Mean	SD	t	df	Sig (α_{Bonf} = .025)
Older books/magazines and a few games	0.2164	0.1836	41.28	1226	*
Current books/magazines and a range of games	0.3346	0.1777	65.93	1226	*

An ANOVA revealed a main effect of attribute level, $F(1, 1219) = 259.92$, $p < .001$. Post hoc testing showed that all pairwise differences among levels were significantly different. There were no other main effects or interactions.

Gym Ventilation

This attribute addressed the kind of ventilation present in a base camp gym. The levels of this attribute were:

- Doors opening and closing (reference)
- Windows
- Windows and fans
- Windows and fans with an air filtration system

The following table presents the mean and standard deviation for each non-reference level as well as the results of t-tests comparing each level against zero (an asterisk in the "sig" column indicates the test was significant at the given adjusted alpha):

Level	Mean	SD	t	df	Sig (α_{Bonf} = .0167)
Windows	0.0443	0.1843	8.42	1226	*
Windows and fans	0.1708	0.1804	33.15	1226	*
Windows and fans with air filtration	0.3132	0.1889	58.07	1226	*

An ANOVA revealed a main effect of attribute level, $F(2, 2438) = 657.69$, $p < .001$. Post hoc testing showed that all pairwise differences among levels were significantly different. There were no other main effects or interactions.

Care Package Frequency

This attribute addressed how often Soldiers could expect to receive care packages through the mail. The levels of this attribute were:

- Once a month (reference)
- Twice a month
- Every 7 days
- Every 3 days
- Every day

The following table presents the mean and standard deviation for each non-reference level as well as the results of t-tests comparing each level against zero (an asterisk in the "sig" column indicates the test was significant at the given adjusted alpha):

Level	Mean	SD	t	df	Sig (α_{Bonf} = .0125)
Twice a month	-0.0334	0.1685	-7.05	1226	*
Every 7 days	0.1529	0.1838	29.15	1226	*
Every 3 days	0.2473	0.1846	46.95	1226	*
Every day	0.2733	0.1769	54.12	1226	*

Note that for this attribute, receiving care packages twice per month had a lower preference rating than the reference level. An ANOVA revealed a main effect of attribute level, $F(3, 3657) = 733.82$, $p < .001$. Post hoc testing showed that all pairwise differences among levels were significantly different. There were no other main effects or interactions.

Equipment for Group Sports

This attribute addressed whether Soldiers would be able to access equipment for group sports, such as volleyball, basketball, and football. The levels of this attribute were:

- No (reference)
- Yes

The following table presents the mean and standard deviation for each non-reference level as well as the results of t-tests comparing each level against zero (an asterisk in the "sig" column indicates the test was significant at the given adjusted alpha):

Level	Mean	SD	t	df	Sig (α_{Bonf} = .05)
Yes	0.2564	0.2014	44.58	1226	*

There were no other main effects of any demographic factors.

TV/DVD/VCR in Billets

This attribute addressed whether Soldiers would have access to a TV and DVD player in their billets. The levels of this attribute were:

- No (reference)
- Yes

The following table presents the mean and standard deviation for each non-reference level as well as the results of t-tests comparing each level against zero (an asterisk in the "sig" column indicates the test was significant at the given adjusted alpha):

Level	Mean	SD	t	df	Sig (α_{Bonf} = .05)
Yes	0.2419	0.1931	89.96	1226	*

There were no main effects involving demographic variables.

Unit-Provided Gaming Console in MWR Area

This attribute addressed whether Soldiers would have access to a unit-provided (versus personal) gaming console (e.g., PlayStation, XBox) in the MWR area. The levels of this attribute were:

- No (reference)
- Yes

The following table presents the mean and standard deviation for each non-reference level as well as the results of t-tests comparing each level against zero (an asterisk in the "sig" column indicates the test was significant at the given adjusted alpha):

Level	Mean	SD	t	df	Sig (α_{Bonf} = .05)
Yes	0.2389	0.1876	44.63	1226	*

There was a main effects of gender, $F(1, 1219) = 3.94$, $p < .05$. Male Soldiers cared more about having a game console in their MWR area ($M = 0.2412$, $SD = 0.1871$) than female Soldiers ($M = 0.1884$, $SD = 0.1926$). There were no other main effects of demographic factors.

TV/DVD/VCR in Dining Area

This attribute addressed whether Soldiers would have access to a TV and DVD player in the dining area. The levels of this attribute were:

- No (reference)
- Yes

The following table presents the mean and standard deviation for each non-reference level as well as the results of t-tests comparing each level against zero (an asterisk in the "sig" column indicates the test was significant at the given adjusted alpha):

Level	Mean	SD	t	df	Sig (α_{Bonf} = .05)
Yes	0.1980	0.1862	37.26	1226	*

There were no main effects involving demographic variables.

Unit-Provided Gaming Console in Billets

This attribute addressed whether Soldiers would have access to a unit-provided (versus personal) gaming console (e.g., PlayStation, XBox) in their billets. The levels of this attribute were:

- No (reference)
- Yes

The following table presents the mean and standard deviation for each non-reference level as well as the results of t-tests comparing each level against zero (an asterisk in the "sig" column indicates the test was significant at the given adjusted alpha):

Level	Mean	SD	t	df	Sig (α_{Bonf} = .05)
Yes	0.1923	0.2030	33.19	1226	*

There were no main effects of demographic factors.

TV/DVD/VCR in MWR Area

This attribute addressed whether Soldiers would have access to a TV and DVD player in the MWR area. The levels of this attribute were:

- No (reference)
- Yes

The following table presents the mean and standard deviation for each non-reference level as well as the results of t-tests comparing each level against zero (an asterisk in the "sig" column indicates the test was significant at the given adjusted alpha):

Level	Mean	SD	t	df	Sig (α_{Bonf} = .05)
Yes	0.1714	0.1883	89.96	1226	*

There were no main effects involving demographic variables.

TV/DVD/VCR in Gym Area

This attribute addressed whether Soldiers would have access to a TV and DVD player in their gym. The levels of this attribute were:

- No (reference)
- Yes

The following table presents the mean and standard deviation for each non-reference level as well as the results of t-tests comparing each level against zero (an asterisk in the "sig" column indicates the test was significant at the given adjusted alpha):

Level	Mean	SD	t	df	Sig (α_{Bonf} = .05)
Yes	0.1703	0.1929	30.92	1226	*

There was a main effects of primary work location, $F(1, 1219) = 4.64$, $p < .05$. Soldiers who worked primarily inside the wire cared more about having a TV/DVD in their gym ($M = 0.1814$, $SD = 0.1919$) than Soldiers who worked primarily outside the wire ($M = 0.1606$, $SD = 0.1934$). There were no other main effects of demographic factors.

Reading Room/Quiet Space

This attribute addressed whether a base camp included dedicated space for reading or other quiet activities. The levels of this attribute were:

- No (reference)
- Yes

The following table presents the mean and standard deviation for each non-reference level as well as the results of t-tests comparing each level against zero (an asterisk in the "sig" column indicates the test was significant at the given adjusted alpha):

Level	Mean	SD	t	df	Sig (α_{Bonf} = .05)
Yes	0.1146	0.1960	20.48	1226	*

An ANOVA revealed a main effect of gender level, $F(1, 1219) = 6.97$, $p < .01$. Female Soldiers cared more about having a reading room or other quiet space ($M = 0.1848$, $SD = 0.1869$) than male Soldiers ($M = 0.1112$, $SD = 0.1959$). There were no other main effects.

Personal Security

Body Armor Inside the Wire

This attribute addressed whether Soldiers would have to wear body armor inside the wire. The levels of this attribute were:

- IOTV with front, back, and side plates (BAPL 5; reference)
- IOTV with front and back plates (BAPL 4)
- Plate carrier with front, back, and side plates (BAPL 3)
- Plate carrier with front and back plates (BAPL 2)
- IOTV or plate carrier with soft armor only (BAPL 1)
- No armor

The following table presents the mean and standard deviation for each non-reference level as well as the results of t-tests comparing each level against zero (an asterisk in the "sig" column indicates the test was significant at the given adjusted alpha):

Level	Mean	SD	t	df	Sig (α_{Bonf} = .01)
BAPL 4	0.0694	0.1850	13.13	1226	*
BAPL 3	0.3588	0.1740	72.23	1226	*
BAPL 2	0.5708	0.1749	114.27	1226	*
BAPL 1	0.3722	0.1842	70.76	1226	*
No armor	0.9936	0.1722	202.17	1226	*

An ANOVA revealed a main effect of attribute level, $F(4, 4876) = 4368.29$, $p < .001$. Post hoc testing showed that all pairwise differences among levels were significantly different except for the difference between BAPL 1 and BAPL 3. In addition, there was a main effect of MOS, F(1,

1219) = 5.08, p < .05. Soldiers in combat MOS cared more about the level of body armor required inside the wire (M = 0.4766, SD = 0.3566) than Soldiers in support MOS (M = 0.4674, SD = 0.3492). There were no other main effects or interactions.

Locks on Latrines

This attribute addressed whether latrines could be locked. The levels of this attribute were:

- No locks (reference)
- Keyed locks
- Cipher locks
- ID card locks
- Latch

The following table presents the mean and standard deviation for each non-reference level as well as the results of t-tests comparing each level against zero (an asterisk in the "sig" column indicates the test was significant at the given adjusted alpha):

Level	Mean	SD	t	df	sig (α_{Bonf} = .0125)
Keyed	0.0595	0.1689	12.33	1226	*
Cipher	0.1267	0.1854	23.95	1226	*
ID card	0.0382	0.1808	7.40	1226	*
Latch	0.1822	0.1874	34.05	1226	*

An ANOVA revealed a main effect of attribute level, F(3, 3657) = 158.09, p <.001. Post hoc testing showed that all pairwise differences among levels were significantly different. There were no other main effects or interactions.

Locks on Billets

This attribute addressed whether billets could be locked. The levels of this attribute were:

- No locks (reference)
- Keyed locks
- Cipher locks
- ID card locks
- Latch

The following table presents the mean and standard deviation for each non-reference level as well as the results of t-tests comparing each level against zero (an asterisk in the "sig" column indicates the test was significant at the given adjusted alpha):

Level	Mean	SD	t	df	Sig (α_{Bonf} = .0125)
Keyed	0.0939	0.1815	18.12	1226	*
Cipher	0.1816	0.1736	36.63	1226	*
ID	0.0892	0.1829	17.09	1226	*
Latch	0.1344	0.1758	26.78	1226	*

An ANOVA revealed a main effect of attribute level, $F(3, 3657) = 69.94$, $p < .001$. Post hoc testing showed that all pairwise differences among levels were significantly different except for the difference between keyed locks and cipher locks. There were no other main effects or interactions.

Locks on Shower Structures

This attribute addressed shower structures present on a base camp that could be locked. The levels of this attribute were:

- No locks (reference)
- Keyed locks
- Cipher locks
- ID card locks
- Latch

The following table presents the mean and standard deviation for each non-reference level as well as the results of t-tests comparing each level against zero (an asterisk in the "sig" column indicates the test was significant at the given adjusted alpha):

Level	Mean	SD	t	df	sig ($\alpha_{Bonf} = .0125$)
Keyed	0.0822	0.1756	16.41	1226	*
Cipher	0.0750	0.1754	14.98	1226	*
ID card	0.0398	0.1835	7.59	1226	*
Latch	0.0445	.01972	7.91	1226	*

An ANOVA revealed a main effect of attribute level, $F(3, 3657) = 16.03$, $p < .001$. Post hoc testing showed that keyed and cipher locks were rated similarly, as were ID card and latch locks. The differences in preferences between the former pair of options (key and cipher) and the latter pair (ID card and latch) were significant. There were no other main effects or interactions.

Spiritual and Psychological Support

Level of Spiritual/Psychological Support

This attribute addressed the kind of spiritual and psychological support Soldiers could expect on a base camp. The levels of this attribute were:

- None (reference)
- Behavioral Health Specialist (BHS)
- Chaplain
- Chaplain of same denomination
- Resilience NCO

The following table presents the mean and standard deviation for each non-reference level as well as the results of t-tests comparing each level against zero (an asterisk in the "sig" column indicates the test was significant at the given adjusted alpha):

Level	Mean	SD	t	df	Sig (α_{Bonf} = .0125)
BHS	0.0782	0.1789	15.31	1226	*
Chaplain	0.1307	0.1819	25.17	1226	*
Chaplain of your denomination	0.1598	0.1790	31.27	1226	*
Resilience NCO	0.0011	0.1723	0.23	1226	n.s.

An ANOVA revealed a main effect of attribute level, $F(3, 3657) = 181.39$, $p < .001$. Post hoc testing showed that all pairwise differences among levels were significantly different. There were no other main effects or interactions.

Sacred Space

This attribute addressed whether a base camp provides sacred space, such as a chapel or spiritual area reserved for religious devotion, meditation, or other forms of spiritual devotion. The levels of this attribute were:

- None (reference)
- Shared space, such as a corner of an MWR shelter
- Dedicated space

The following table presents the mean and standard deviation for each non-reference level as well as the results of t-tests comparing each level against zero (an asterisk in the "sig" column indicates the test was significant at the given adjusted alpha):

Level	Mean	SD	t	df	Sig (α_{Bonf} = .025)
Shared	0.1057	0.1939	19.09	1226	*
Dedicated	0.1306	0.1821	25.13	1226	*

An ANOVA revealed a main effect of attribute level, $F(1, 1219) = 10.66$, $p < .01$. There were no other main effects or interactions.

Access to Spiritual/Psychological Support

This attribute addressed how often Soldiers could expect to have access to spiritual and psychological support. The levels of this attribute were:

- Co-located at camp and available as needed
- Rotational and available every 1-2 weeks
- Rotational and available once a month (reference)

The following table presents the mean and standard deviation for each non-reference level as well as the results of t-tests comparing each level against zero (an asterisk in the "sig" column indicates the test was significant at the given adjusted alpha):

Level	Mean	SD	t	df	Sig (α_{Bonf} = .025)
Co-located	0.0276	0.1928	5.02	1226	*
Rotational – 1-2 weeks	0.0259	0.1827	4.97	1226	*

There were no main effects or interactions. In particular, the main effect of attribute level was not significant, suggesting that Soldiers had no difference in preference between spiritual and psychological support that was co-located versus available every 1-2 weeks on a rotational basis.

Work Area

Convenience Power in Work Area

This attribute addressed how much power Soldiers could access for personal electronics in their work area. The levels of this attribute were:

- None (reference)
- Enough to power up to three small devices (e.g., cell phone)
- Enough to power one medium device (e.g., laptop computer)
- Enough to power one medium and up to three small devices

The following table presents the mean and standard deviation for each non-reference level as well as the results of t-tests comparing each level against zero (an asterisk in the "sig" column indicates the test was significant at the given adjusted alpha):

Level	Mean	SD	t	df	Sig (α_{Bonf} = .0167)
Up to 3 small devices	0.4215	0.1815	81.37	1226	*
1 medium device	0.4384	0.1821	84.35	1226	*
1 medium and up to 3 small devices	0.6527	0.1825	125.26	1226	*

An ANOVA revealed a main effect of attribute level, $F(2, 2438) = 598.21$, $p < .001$. Post hoc testing showed that all pairwise differences among levels were significantly different except for the difference between the second and third levels (up to 3 small devices vs. 1 medium device). In addition, there was a main effect of gender, $F(1, 1219) = 5.87$, $p < .05$. Female Soldiers cared more about having convenience power in their work area ($M = 0.5378$, $SD = 0.2045$) than male Soldiers ($M = 0.5027$, $SD = 0.2104$). There were no other main effects or interactions.

Work Area Temperature

This attribute addressed the temperature in base camp work areas. The levels of this attribute were:

- 90°F (reference)
- 80°F
- 70°F
- 60°F
- 50°F

The following table presents the mean and standard deviation for each non-reference level as well as the results of t-tests comparing each level against zero (an asterisk in the "sig" column indicates the test was significant at the given adjusted alpha):

Level	Mean	SD	T	df	Sig (α_{Bonf} = .0125)
80 °F	0.2181	0.1799	42.46	1226	*
70 °F	0.4104	0.1736	82.80	1226	*
60 °F	0.5757	0.1769	113.96	1226	*
50 °F	0.5609	0.1787	109.97	1226	*

An ANOVA revealed a main effect of attribute level, $F(3, 3657) = 1042.93$, $p < .001$. Post hoc testing showed that all pairwise differences among levels were significantly different except for the difference between 50° and 60°. In addition, there was a main effect of MOS, $F(1, 1219) = 5.81$, $p < .05$. Soldiers in combat MOS cared more about the temperature of their work area ($M = 0.4449$, $SD = 0.2278$) than Soldiers in support MOS ($M = 0.4358$, $SD = 0.2295$). There were no other main effects or interactions.

Overhead Lighting in Work Area

This attribute addressed the kind of overhead lighting Soldiers might encounter in base camp work areas. The levels of this attribute were:

- None – flashlights only (reference)
- Blackout lights
- Overhead light bank controlled by a single switch
- Zoned overhead lighting controlled by multiple switches

The following table presents the mean and standard deviation for each non-reference level as well as the results of t-tests comparing each level against zero (an asterisk in the "sig" column indicates the test was significant at the given adjusted alpha):

Level	Mean	SD	t	df	Sig (α_{Bonf} = .0167)
Blackout lights	0.1165	0.1814	22.50	1226	*
Overhead lights – single switch	0.4777	0.1891	88.48	1226	*
Overhead lights – multiple switches	0.5065	0.1784	99.47	1226	*

An ANOVA revealed a main effect of attribute level, $F(2, 2438) = 1703.54$, $p < .001$. Post hoc testing showed that all pairwise differences among levels were significantly different. In addition, there was an interaction between level and MOS, $F(2, 2438) = 3.47$, $p < .05$. As shown in Figure C11, Soldiers in support MOS had no difference in preference between overhead lighting controlled by a single switch versus overhead lighting with multiple zones controlled by separate switches. In contrast, Soldiers in combat MOS had a relatively larger preference for more fine-grained control over work area lighting through multiple light banks. There were no other main effects or interactions.

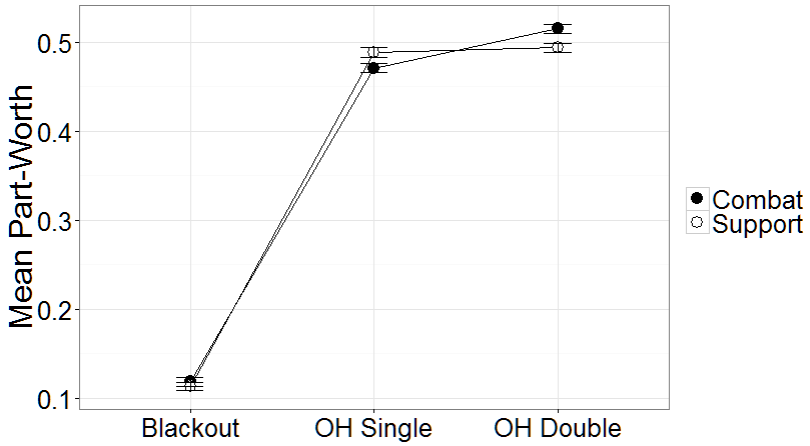


Figure C-11. Interaction between work area lighting level and MOS. OH = overhead lighting. Error bars represent plus and minus one standard error.

Humidity in Work Area

This attribute addressed the humidity level in base camp work areas. The levels of this attribute were:

- 70% - damp/humid air (reference)
- 50% - average
- 30% - dry air

The following table presents the mean and standard deviation for each non-reference level as well as the results of t-tests comparing each level against zero (an asterisk in the "sig" column indicates the test was significant at the given adjusted alpha):

Level	Mean	SD	t	df	Sig (α_{Bonf} = .025)
50%	0.3456	0.1790	67.63	1226	*
30%	0.4784	0.1883	88.99	1226	*

An ANOVA revealed a main effect of attribute level, $F(1, 1219) = 319.19$, $p < .001$. Post hoc testing showed that all pairwise differences among levels were significantly different. In addition, there was a main effect of MOS, $F(1, 1219) = 3.96$, $p < .05$. Soldiers in support MOS cared more about the humidity level in their work area ($M = 0.4207$, $SD = 0.1953$) than Soldiers in combat MOS ($M = 0.4064$, $SD = 0.1952$). There were no other main effects or interactions.

Ventilation in Work Area

This attribute addressed the kind of ventilation present in base camp work areas. The levels of this attribute were:

- Doors opening and closing (reference)
- Windows
- Windows and fans
- Windows and fans with an air filtration system

The following table presents the mean and standard deviation for each non-reference level as well as the results of t-tests comparing each level against zero (an asterisk in the "sig" column indicates the test was significant at the given adjusted alpha):

Level	Mean	SD	t	df	Sig (α_{Bonf} = .0167)
Windows	0.0669	0.1739	13.49	1226	*
Windows and fans	0.2448	0.1800	47.63	1226	*
Windows and fans with air filtration	0.4162	0.1847	78.94	1226	*

An ANOVA revealed a main effect of attribute level, $F(2, 2438) = 1134.27$, $p < .001$. Post hoc testing showed that all pairwise differences among levels were significantly different. In addition, there was a main effect of MOS, $F(1, 1219) = 6.10$, $p < .05$. Soldiers in combat MOS cared more about ventilation in their work area ($M = 0.2482$, $SD = 0.2306$) than Soldiers in support MOS ($M = 0.2342$, $SD = 0.2271$). There were no other main effects or interactions.

Convenience Electronics in Work Area

This attribute addressed whether Soldiers would have access to convenience electronics in their work area, including small appliances such as a coffee maker or microwave. The levels of this attribute were:

- No (reference)
- Yes

The following table presents the mean and standard deviation for each non-reference level as well as the results of t-tests comparing each level against zero (an asterisk in the "sig" column indicates the test was significant at the given adjusted alpha):

Level	Mean	SD	t	df	Sig (α_{Bonf} = .05)
Yes	0.3473	0.1949	62.41	1226	*

There was a main effect of rank, $F(2, 1219) = 3.22$, $p < .05$. Senior enlisted cared more about having convenience electronics in their work area ($M = 0.3611$, $SD = 0.1912$) than officers ($M = 0.3561$, $SD = 0.1953$) or junior enlisted ($M = 0.3324$, $SD = 0.1976$). Post hoc testing showed that only the difference between senior and junior enlisted reached statistical significance. In addition, there was a main effect of primary work location, $F(1, 1219) = 5.78$, $p < .05$. Soldiers who worked primarily inside the wire cared more about having convenience electronics in their work area ($M = 0.3606$, $SD = 0.2007$) than Soldiers who worked primarily outside the wire ($M = 0.3358$, $SD = 0.1892$). Finally, there was a main effect of camp experience, $F(2, 1219) = 4.89$, $p < .01$. Soldiers who spent most of their time on camps housing 50 or fewer Soldiers cared more about having convenience electronics in their work area ($M = 0.3750$, $SD = 0.1948$) than Soldiers who spent most of their time on camps housing 51-300 personnel ($M = 0.3458$, $SD = 0.1817$) or 301-1000 personnel ($M = 0.3362$, $SD = 0.2060$). Post hoc testing showed that only the difference between Soldiers with the most experience on the smallest camps (50 or fewer personnel) versus those with the most experience on the largest camps (301-1000 personnel) reached statistical significance.

Work Area Construction

This attribute addressed the construction of the work area a Soldier would primarily use while inside the wire. This could be the tactical operations center (TOC), a maintenance bay, medical aid station, or other area. The levels of this attribute were:

- Soft walled shelter (reference)
- Rigid walled shelter
- Hybrid
- Hard stand building

The following table presents the mean and standard deviation for each non-reference level as well as the results of t-tests comparing each level against zero (an asterisk in the "sig" column indicates the test was significant at the given adjusted alpha):

Level	Mean	SD	t	df	Sig (α_{Bonf} = .0167)
Rigid walled	0.1106	0.1717	22.56	1226	*
Hybrid	0.2569	0.1788	50.35	1226	*
Hard stand	0.3387	0.1755	67.62	1226	*

An ANOVA revealed a main effect of attribute level, $F(2, 2438) = 519.16$, $p < .001$. Post hoc testing showed that all pairwise differences among levels were significantly different. There were no other main effects or interactions.

Ability to Control Temperature in Work Area

This attribute addressed whether Soldiers would be able to control the temperature in base camp work areas. The levels of this attribute were:

- No – set by SOP (reference)
- Yes

The following table presents the mean and standard deviation for each non-reference level as well as the results of t-tests comparing each level against zero (an asterisk in the "sig" column indicates the test was significant at the given adjusted alpha):

Level	Mean	SD	t	df	Sig (α_{Bonf} = .05)
Yes	0.2806	0.1982	49.54	1226	*

There were no other main effects of any demographic factors.

Dedicated Latrine in Work Area

This attribute addressed whether Soldiers would have a latrine in their work area. The levels of this attribute were:

- No (reference)
- Yes

The following table presents the mean and standard deviation for each non-reference level as well as the results of t-tests comparing each level against zero (an asterisk in the "sig" column indicates the test was significant at the given adjusted alpha):

Level	Mean	SD	t	df	Sig ($\alpha_{Bonf} = .05$)
Yes	0.2089	0.1963	37.27	1226	*

There were no other main effects of any demographic factors.

This page intentionally left blank

List of Acronyms

1SG	First Sergeant
AAR	After Action Review
ANOVA	Analysis of Variance
ATP	Army Techniques Publication
BCMP	Base Camp Master Plan
BDE	Brigade
BN	Battalion
CB	Contingency Base
CI	Confidence Interval
CO	Commanding Officer
DCE	Discrete Choice Experiment
DFAC	Dining Facilities Administration Center
DP	Duty Position
FOB	Forward Operating Base
HBE	Hierarchical Bayesian Estimation
HVAC	Heating, Ventilation, & Air Conditioning
MCMC	Markov Chain Monte Carlo
MOS	Military Occupational Specialty
MP	Military Police
MRE	Meal Ready-to-Eat
MSCOE	Maneuver Support Center of Excellence
MWR	Morale Welfare and Recreation
NSRDEC	Natick Soldier Research Development and Engineering Center

OCIE	Organizational clothing and individual equipment
PAX	Personnel
PL	Platoon Leader
PSG	Platoon Sergeant
RC	Regional Command
RMSE	Root Mean Square Error
SLB-STO-D	Sustainability/Logistics Basing Science and Technology Objective Demonstration Basing Demonstration
SME	Subject Matter Expert
QoL	Quality of Life
TAT	Technology Assessment Tool
TECD	Technology-Enabled Capability Demonstration
TOC	Tactical Operations Center
TTPs	Tactics, Techniques, and Procedures
UGR	Unitized Group Ration